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Investigators of Materials of Construction

The Beginnings, Personalities and Aims of the International Association for Testing Materials Which Holds a Meeting in America This Week

The United States is conspicuously honored this year by several international scientific meetings which seem to have settled on dates all within a few months of one another. Particularly prominent among these is the congress now in progress in New York City of the International Association for Testing Materials. This association, of which the American Society for Testing Materials is substantially a branch, has already done much and promises still more toward the establishment of uniform requirements of materials for given purposes and stands as one of the monuments of the present era's recognition of mutual assistance as a means for accelerating progress. It has given attention to methods and apparatus for checking the quality and properties of the material supplied according to given specifications. As an organization closely linking scientific facts to commercial considerations it has to the present held itself to the study of iron and steel and non-ferrous metals, natural and artificial building stones, cements and mortars and other materials of a practical value. The wide interest is indicated in the representation by foreign countries of one-third of the total attendance, which at this writing promises to be 800. The exigencies of language differences among the delegates do not appear to retard progress to any extent, a fact which is a tribute to the linguistic attainments of the European scientist. Elsewhere is an account of the early deliberations of the present congress.

DR. HENRY MARION HOWE

Presiding Officer of the Sixth Congress of the International Association for Testing Materials, New York, September 3-7, 1912

The International Association, it is generally agreed, has its origin in a conference of a small group of workers in experimental engineering held in Munich in 1882 at the instance chiefly of the late Prof. John Bauschinger. From this developed a series of meetings, as follows: Dresden in 1884, Berlin in 1886, Munich in 1888, Vienna in 1893 and Zurich in 1895. At the last, an account of which was printed in *The Iron Age* of October 10, 1895, the International Association was formally organized. The meeting was held September 9 to 11, with 300 members and delegates present. England was represented by one engineer and the United States, after much persuasion, sent Capt. O. M. Carter, Corps of Engineers, U. S. A. An American had, however, been present at the Vienna meeting in the person of the late Gus. C. Henning, who represented the American Society of Mechanical Engineers in the Zurich meeting. Among others present were Prof. A. Martens, director of the Royal Material Testing Station in Berlin, who for years has been one of the vice-presidents of the association; Prof. Henry Le Chatelier, inspector-general of mines, Paris, France, and Dr.-Ing. Nicholas Belelubsky, professor emeritus of the Institute of Engineers of Ways of Communication of Emperor Alexander I. at St. Petersburg, and the late Prof. Ludwig von Tetmajer, who called the meeting to order and was elected president, a position he held until his death. Both Professors Martens and Belelubsky were vice-presidents of the meeting, the others of the four then elected being Baron Quinette de Rochemont, Paris, and State Councillor Dr. Berger, Vienna, who became acting president on the death of Prof. Tetmajer.

The second congress was held at Stockholm in 1897, while the third, held at Budapest, did not take place until 1901. In the meantime through the activities of Mr. Henning, who was a member of the Council of the International Association, an American section of the International Association was formed in Philadelphia on June 16, 1898. Among those taking an active part in what was later incorporated as the American Society for Testing Materials, were Prof. Mansfield Merriman, who was made chairman; Dr. Henry M. Howe, who was made vice-chairman and Paul Kreuzpointner, Altoona, Pa., treasurer, and R. L. Humphrey, Philadelphia, secretary. According also to the report of the meeting in *The Iron Age* of June 23, 1898, Dr. Richard Moldenke was a prominent factor and he with Dr. Howe were named councillors. On the Budapest congress Dr. Howe made a report, printed in the proceedings of the American Society.

The fourth congress of the International Association was held in Brussels, September 3 to 6, 1906, and there was an attendance of no less than 500 members from 18 different countries, but there was no delegate from the United States. A feature of this meeting was an address by Professor Le Chatelier on "The Practical Value of Metallography," a subject which late years have abundantly recognized. Franz Berger was acting president and the vice-

presidencies continued to be held by Professors Martens and Belelubsky, with Ernst Reitler, Vienna, already for a number of years general secretary.

The fifth congress, though it is the plan of the by-laws to hold congresses at two-year intervals, was held in Copenhagen, September 7 to 11, 1909. Alexander Foss, of F. L. Smidth & Co., Copenhagen, was president and the vice-presidents and general secretary were as before. An extended report was given in *The Iron Age* of September 23, 1909. There was a good American representation and the late Dr. Charles B. Dudley was elected president. The sixth and the present congress is that now in session in New York, with Dr. Howe acting as president, by vote of the council subsequent to the death of Dr. Dudley.

CAPT. ROBERT W. HUNT
President of the American Society for Testing Materials

Besides Professors Martens and Belelubsky as vice-presidents, Prof. A. Mesnager, chief engineer of bridges and highways and director of the laboratories of the National School of Bridges and Highways, Paris, France, was appointed vice-president. It is generally understood that St. Petersburg, Russia, will be chosen for the next congress, in 1915, and that Prof. Belelubsky will be named as the next president.

G. C. LLOYD
Member of Council from Great Britain

PROF. N. BELELUBSKY, DR. ING.
Vice-President of the International Association

J. O. ROOS AF HJELMSÄTER
Member of Council from Sweden

Some idea of what the association is attempting to accomplish may be gained by a brief enumeration of some of the problems which are brought to the present congress in different stages of solution. They include unified specifications for iron and steel, A. Rieppel, Nuremberg, Germany, general chairman. The American members engaged in this committee work are: Carnegie Steel Company, Dr. Howe, Paul Kreuzpointner, Dr. Moldenke, William R. Webster and W. A. Bostwick, vice-president of the Orford Copper Company. W. Brüggemann, Dortmund, Germany, is chairman of a sub-commitee on cast iron and cast iron products, and Dr. Moldenke and Walter Wood, R. D. Wood & Co., Philadelphia, are American members.

Another branch of the work is in the hands of a committee on uniform nomenclature of iron and steel, Dr. Howe, chairman. Prof. Albert Sauveur, Harvard University, is secretary of the committee and among its American members are R. Hibbard, representing the American Institute of Mining Engineers; Charles Kirchhoff, representing the American Iron and Steel Institute; Prof. William Campbell of Columbia University; Prof. Joseph W. Richards of Lehigh University and Hugh P. Tiemann, metallurgist Carnegie Steel Company.

Another committee, of which Dr. Howe is chairman and Prof. Sauveur is secretary, has been engaged in defining the microscopic constituents of iron and steel. Some of the other problems have to do with testing welds and weldability, with methods of testing cast iron and finished castings, with impact tests on notched bars, with hardness, with the relations among chemical composition, thermic treatment and properties of special steels, with the resistance of metals to alternating stresses, with the influence of increased temperature on the ductility and malleability of metals, with the classification of pig iron, etc. A similar variety of problems relating to cements, stones and concrete have been in the hands of different committees and as regards what may be called miscellaneous materials, there are about a half dozen problems under consideration. Dr. Allerton S. Cushman is referee for one of these problems, on methods of testing the protective power of paints used on metallic structures. Prof. Augustus H. Gill, of the Massachusetts Institute of Technology, is a member of a committee on specifications of oil for technical purposes.

PROF. A. MARTENS, DR. ING.
Vice-President of the International Association

It is to be mentioned that the resolutions of the congresses on technical questions are intended to serve to express the opinion of the majority. They are not binding on the entire membership, but of course carry great weight. They are carried only on at least three-fourths vote. The mass of information likely to result from the present congress may be taken in the light of the proceedings of the last congress, which aggregated 1000 pages. For the present congress there are about 170 foreign and 35 American papers.

Some of the Prominent Personages

Among the central figures of the International Association for Testing

Materials are of course the presiding officer, the three vice-presidents and the members of council, comprising a representative of each country having 20 members and mandatories appointed by the council from countries having a membership of less than 20. Portraits are here presented of the acting-president and of two of the vice-presidents, the third, Prof. A. Mesnager of Paris not having arrived at this writing. Photographs of other members of the council are also given, together with likenesses of foreign members who have taken a prominent part in furthering the association's objects. To complete the foregoing outline of the International Association, a few brief biographical sketches are appended as follows:

F. W. HARBORD
Representing the Institution of Mining and Metallurgy, London

DR. WALTER ROSENHAIN
Representing the National Physical Laboratory, Teddington, near London

PROF. E. HEYN
Sub-Director of the Royal Prussian Material Testing Bureau Berlin-Lichterfelde

Dr. Henry Marion Howe, who was born March 2, 1848, was the son of Dr. Samuel Gridley and Julia Ward Howe. He was graduated from Harvard College in 1869 with the degree of A.B. and received the degree of B.S. from the Massachusetts Institute of Technology in 1871 and A.M. from Harvard in 1872. The degree of LL.D. was conferred on him by both Harvard and Lafayette in 1905. In 1877 he went to Chile in connection with copper smelting and designed and built plants for the Orford Copper Company in this country in 1880-1882. He was later engaged in Boston as consulting metallurgist and lecturer before the Massachusetts Institute of Technology. In 1890 he introduced into this country the manufacture of manganese steel. He has been professor of metallurgy in Columbia University since 1897. He was awarded the Bessemer medal of the Iron and Steel Institute (Great Britain) in 1895, was gold medalist of the Verein zur Beförderung des Gewerbleisses in 1895 and the Elliot Cresson gold medallist of the Franklin Institute in 1895. He was president of the jury of mines and mining of the Chicago Exposition in 1893 and member of the jury of the Paris expositions of 1889 and 1900. He is chevalier of the Legion d'Honneur, France, and knight of the Order of St. Stanislaus, Russia, 1906. He was president of the American Institute of Mining Engineers in 1893 and lately president of the American Society for Testing Materials. He is honorary member of the Russian Imperial Technical Society, the British Institution of Mining and Metallurgy, the Swedish Royal Academy of Science, and the Société d'Encouragement pour l'Industrie Nationale, Paris. He is the author of "Copper Smelting," "Metallurgy of Steel," "Metallurgical Laboratory Notes" and "Iron, Steel and Other Alloys."

JEAN-FERNAND CELLERIER
Director Testing Laboratory, Conservatory of Arts and Measures, France

EMILE T. CAMERMAN
Chief Chemist, Department of Railways, Posts and Telegraph, Belgium

Prof. N. Belelubsky, who as stated is generally regarded as the next president of the association, was born in 1845. He was educated at the gymnasium of Taganrog and at the Institute of Engineers of Ways of Communication of Emperor Alexander I. at St. Petersburg. He is now professor emeritus and in charge of the mechanical laboratory of the Institute. He has been in the service of the government of Russia since 1867 and professor and manager of the laboratory since 1874. For 30 years he has devoted himself to the strength of materials and for several years has taught bridge design. He also conducted courses on tests of materials in the architectural school of the Academy of Fine Arts, St Petersburg, and the Poiytechnic Institute for Women, founded in 1906 and attended by more than 600 students. Prof. Belelubsky is a member of the Academy of Fine Arts, president of the council of the Russian Cement Congress, president of the Polytechnic of the Institute for Women, permanent secretary of the Pupils' Benefit Society of the Institute of Engineers and president of the permanent government commission on bridges. His personal engineering work has been in the design of bridges, including the replacement of wooden bridges on the St. Petersburg-Moscow railroad by steel bridges, bridges over the Volga near Sysran and the Dnieper at Jecaterinoslaw, both over a kilometer in length, bridges on the Siberian railroad and a recent bridge over the Volga near Kasan. He originated in 1888 a type of bridge construction with hinged spans, which has been applied to a large number of bridges in Russia and subsequently in other countries. Prof. Belelubsky is honorary member of the St. Petersburg Institute mentioned, the Société des Ingénieurs civils de France, the So-

PROF. P. D. C. KLEY
Professor of Metallography, Technical High School, Delft, Holland

ciety of Architects of Berlin, and he was given the degree of doctor of engineering by Technical High School of Charlottenburg, Berlin.

Prof. Dr.-Ing. Adolf Martens was born March 6, 1850, at Backendorf bei Hagennow, i.M. He worked two years practically in machine construction, then studied at a trade school in Berlin, and in 1871 entered the bridge construction bureau of Ostbahn in Bromberg, where he was engaged in the design of the Weichsel und Memel bridges. Some years later he moved to Dortmund, and devoted himself to the testing of materials and the practical study of the iron industry. In 1875 and the following year he was occupied with the building of the Berlin-Nordhausen Railroad, and at this time began his first investigations concerning the microscopic structure of iron. In 1884 he undertook the direction of what is now the Royal Material Testing Bureau at Berlin-Lichterfelde. Prof. Martens is a member of the Royal Prussian Academy of Science, president of the German Society for Testing Materials, and has the degree of doctor from the Royal Technical Highschool at Dresden. He is also a member of the Austrian Engineering and Architectural Society, an honorary member of the Institute of Ways of Communication of St. Petersburg, possessor of a medal of the Vereins Deutscher Ingenieure.

Ernst Reitler, who has been general secretary of the association for the last ten years, is a civil engineer of Vienna and a leading officer of the Austrian State Railways. He is a knight of the Order of Danebrog. He made studies in the United States in 1893 in regard to railroad matters and has published several pamphlets on American and British railroads, covering stations, yards, permanent way, safety appliances and traffic administration. When the first president of the association, Professor Tetmajer, moved in 1901 from Zurich to Vienna, the headquarters of the association were established in Vienna, where they have since been. Mr. Reitler is 50 years of age.

Capt. Robert Woolston Hunt, president of the American Society for Testing Materials, was born in Fallsington, Bucks County, Pa., December 9, 1838. He was educated in Covington, Ky., and worked in a rolling mill at Pottsville, Pa., learning puddling, rolling and other mill operations. He studied analytical chemistry in Philadelphia from 1859 to 1860, and was chemist of the Cambria Iron Company from 1860 to 1861. He entered the Civil War as a private and was captain at its close. He has been the head of Robert W. Hunt & Co., consulting engineers and metallurgists, since 1888. He is a member of the American Society of Civil Engineers, the American Institute of Mining Engineers, of which he was president from 1883 to 1884 and from 1906 to 1907, and was also president of the American Society of Mechanical Engineers in 1891. He was president of the Western Society of Engineers in 1893 and is a member of the Iron and Steel Institute (Great Britain), and the Institution of Mechanical Engineers and the Institution of Civil Engineers (England).

George C. Lloyd received his early education in Germany and was subsequently trained as mechanical engineer at the works of Robert Stephenson & Co., Newcastle-on-Tyne, England. He was afterward occupied as a seagoing engineer and for some years was in the service of the Spanish Royal Mail Steamship Company, the Compañia Translantic of Barcelona. In 1898 he became assistant engineer to Jeremiah Head & Co., the British representatives of the Wellman-Seaver-Morgan Company, Cleveland, Ohio. In 1900 he was appointed assistant to Bennett H. Brough, secretary of the Iron & Steel Institute, and in 1904 became the secretary of the Institution of Electrical Engineers, London. On the death of Mr. Brough, in 1908, he succeeded him as secretary of the Iron & Steel Institute and in the same year was elected the British member of council of the International Association.

J. O. Roos af Hjelmsäter, representing his country as a member of the council of the International Association, was born in 1878 at Stockholm, Sweden. He was graduated as mechanical engineer from the Royal Technical University, Stockholm, and studied chemistry at the Polytechnikum, Zurich, Switzerland. He held positions in the United States in 1901-1903, principally two years as assistant to Thomas Edison at Orange, N. J. He was assistant director from 1904 to 1907 and director from 1907 to date of the Testing Institution of the Royal Technical University at Stockholm. He contributes a paper to the present congress on endurance tests of machine steel.

Prof. Alexander Rejtö is the member of council from Hungary. He is court councillor, member of the Hungarian Academy of Sciences and professor at the University of Technical Sciences, Budapest. His investigations have led him to differentiate between materials the limit of elasticity of which is increased by a permanent deformation and malleable materials, the elastic limit of which remains unchanged during the permanent deformation. He advises care in using the two kinds of materials in juxtaposition, as they follow different laws.

Dr. Walter Rosenhain, B. A., D. Sc., came to New York to attend both the congress of the International Association for Testing Materials and the International Congress of Applied Chemistry as the delegate of the National Physical Laboratory at Teddington, near London. In that institution, which corresponds to some extent with the Bureau of Standards at Washington, Dr. Rosenhain is head of the Department of Metallurgy. He is also a member of Council of the Institute of Metals (London) and is the author of a long series of metallurgical memoirs dealing with the results of researches on metals carried out principally on the lines of modern metallography. He received his university training in Melbourne, Australia, and then at Cambridge, England, where, in conjunction with Professor Ewing, he carried out researches which led to the discovery of "slip bands" in strained metal. In 1906 he joined the National Physical Laboratory as superintendent of the newly formed metallurgy department. A large amount of special apparatus and appliances for metallurgical work has been designed by Dr. Rosenhain, including the Rosenhain metallurgical microscope, quenching apparatus and electrical combustion furnaces.

Prof. E. Heyn, who contributes a review of the progress of metallography from the beginning of 1909 to the end of 1911, was born in 1867 in Annaberg, Erzgebirge, Saxony. He was educated along iron foundry lines in the Bergakademie of Freiberg, Saxony. He gained his practical experience at the works of Fried. Krupp, Essen, and with the Hörder Verein, now the Phoenix Company, in Hörde, Westphalia. Later he was teacher in the Royal Machine Construction and Foundry School in Gleiwitz and in 1898 was called to the Royal Material Testing Bureau, Lichterfelde, Berlin. Since 1901 he has been professor of mechanical technology, foundry practice and strength of materials at the Charlottenburg Technical Highschool. Since 1904 he has been sub-director of the testing bureau. His achievements lie chiefly along the line of researches in metallurgy and metallography, and the development of metallographic investigation to replace ordinary material testing, etc.

Jean-Fernand Cellerier, director of the testing laboratory of the national conservatory of arts and measures of Paris, France, was born in Bordeaux, May 27, 1870. He was educated at the college Sainte-Barbe and then in the polytechnic school, leaving this institution in 1892 as under-lieutenant of artillery. His army experience included a period in the national arms manufactory at Châtellerault. He was appointed to his present position in 1908. He invented a portable electric lamp held in position magnetically and has specialized in electricity. He is a member of the council of the International Society of Electricians, of the Society of Civil Engineers of France and of the council of the École Superieure, Æronautique.

Prof. P. D. C. Kley was born in Kapelle on the Yssel, Holland, October 25, 1871. He was educated at the University of Leiden and at the Polytechnic School at Delft, Holland, where he obtained the degree of chemical engineer. In 1905 he was appointed professor of microchemistry and metallography.

Emile Camerman, chief engineer of tests of the state railroads of Belgium, who contributes to the congress a paper on testing cylinder oils for superheated steam, has devoted himself more particularly to cements, mortar and concrete. He contributed a paper on rubber to the Budapest congress and papers on paint materials and lubricating oils to the Copenhagen congress. He is one of the chairmen of the section having to do with miscellaneous materials.

Presidential Address to Testing Engineers

Lines Which the Work of the International Association May Well Follow in the Future—Specification Making Should Be Added to the Original Plan

BY HENRY M. HOWE

Sons of Britannia, as you are our next of kin, be you near to our hearts!

You Teutons, so near to us in blood, in traditions, and in standards, you are ever welcome.

Sons of fair France, we welcome you to this land of liberty, of equality before the law, and of fraternity; to this land which may be held to owe its very existence as a nation to your aid in our hour of peril.

Welcome, sons of Russia. Your Great Peter has ennobled labor; your Mendelieff, Pavloff, Mechnikoff and Tschernoff have illuminated science; your Rubinstein and Tschaikowsky have inspired us with their strains and your Turgenieff with his words; and your Nicholas the Second has given an incalculable impetus to God's own cause of peace on earth, good will toward men.

Sons of that Italy whose Columbus gave mankind this new world, your presence gives us joy.

O Spain, you who gave Columbus Godspeed, you whose descendants share with us the guidance of this new world, how gladly do we welcome your sons.

Scandinavians, you whose Eric the Red was the first to see this continent, you whose John Ericsson aided so brilliantly in the salvation of this land, we greet you most heartily.

You Orientals, we of the setting salute you of the rising sun.

Canadians, you with whom we are in reciprocity of neighborly trust and brotherly affection, a brotherly greeting to you.

You Danes, so lately our generous hosts; you from Holland, from that sheltering asylum whence the earliest Pilgrims sailed hither; you, indomitable Belgians; you, unconquerable Swiss; a most cordial welcome is yours.

Since we met last the Summoner of kings and peasants has called to rest and peace some priceless leaders of our endless warfare for progress. The bitterness and depth of our loss of the great, good, wise and beloved man whom we chose as our president for this Congress is shown by our outpourings of grief and praise on either side of the Atlantic. In him this society has lost a leader who joined to the highest idealism the complete mastery of our craft, and the most astute practical wisdom.

The royal patron of our last Congress, Frederic of Denmark, that strong supporter of our purposes, that manly king and kingly man, has passed from us.

The rare and beautiful spirit of Floris Osmond, the Shelley and the seer of metallography, has been called from its too fragile dwelling.

Two other shining trophies have been won by death, two members of our council, Jacopo Benetti and August Granfelt.

But here, as ever, death is swallowed up in victory. Our grief is drowned by our flood of gratitude for the privilege of knowing, loving and laboring with such men. Our repining for what might have been is eclipsed by our joy for what has been.

Leading Points in the Address:

It is to make the work of the testing engineer more effective, to guard the lives and the interests of the public the better, that the International Association for Testing Materials exists.

In one direction most tests are very faulty—their conditions are radically unlike the most trying ones of service.

In the future indestructive tests, applied directly to the objects which are to enter into service, must supplement the vicarious destructive tests of coupons.

Specification making should be added to the original plan which made it the work of the association to perfect and unify methods of testing. Bringing together those competent to improve methods of test has also brought together those most competent to draw specifications.

The Association and Its Work

Let us look at our purposes, at the tokens that we are accomplishing them, and at a way in which they may be broadened.

Our purpose is to serve humanity by enabling it to distinguish the fit from the unfit among the materials with which the world's work is done—the materials for its buildings, its bridges, its ships, its railroads, its machinery, and its constructions in general. This is the function of the testing engineer. He stands between the public and the manufacturer who would supply that public to test the fitness of those supplies, to measure accurately their degree of fitness, and to reject unsparingly the unfit. He is a guardian of the lives of those who travel by land or sea, and of those who live or work in buildings of important size. He is a protector of the material interests of the public, because in the last analysis all structures and all materials of which they are made are for the use and benefit of the public individually or collectively, and are paid for directly or indirectly by that public; and it is to the interest of that public that the fitness of those materials for their various purposes shall be known quantitatively to those who select them.

It is to make this work of the testing engineer more effective, to guard the lives and the interests of the public the better, that this association exists. It is an open court in which the public sits in judgment on the various methods of testing. Of that public certain parts are here represented directly by their own engineers. This is true of the great railroads, the great shipbuilders and bridge builders, and the great engineering houses. Other parts of the public are represented indirectly by the middlemen or by the public engineers of tests.

The results of experience in all lands, in all climates and under all conditions, and the points of view of all races, are here focussed in the most searching criticism of the various methods of testing, to the end that the buyer may gauge their fitness with full knowledge, and thus may select intelligently those which give the fullest protection first to himself and ultimately to the public. If one method is unduly favorable to one manufacturer or to the manufacturers of one region or of one country by tending to gloss over the shortcomings of their product and to give undue prominence to its special merits, the public is here warned of the deceptiveness of that test by the evidence offered by the competing manufacturers.

Standards for the World's Competing Goods

However far distant may be the political "Parliament of Man," which is "coming yet for a' that," the industrial parliament of man is already here. The buyer in each country may well say, "My country is the world, my countrymen are all mankind," for wherever his abode he selects the fittest goods, quality and cost considered, without regard to their origin. While he is selecting his purchases, friendship, patriotism, national boundaries, empires, and

continents cease to exist. To-day's market place is the world, and our society is an essential part of that pentecostal market place, in which we enable all races to speak the common language of the methods of testing, that is, of appraising the market place's competing goods.

An important phase of our work is the unification of the methods of testing throughout the world, to the end that the buyer may the more readily and the more justly weigh the relative merits of all competing materials of a given kind, from whatever country they may come. The day has passed when the buyer's ignorance, his inability to ascertain for himself the fitness of what is offered him, forced him to rely on the reputation and on the assurances of the manufacturer or exporter. To-day he relies not on the untested assertions of the seller, however credible, but on his own tests, or on tests made by his own agents. Purchase is no longer a matter of faith but one of knowledge. It is our mission and privilege to carry this substitution of knowledge for faith ever farther and farther.

Attitude Toward New Methods

Turning our attention now in a different direction and asking what our attitude ought to be toward attempts to replace or supplement our present methods of testing with new methods, we find that, though we have good reason to be dissatisfied with our present methods, yet we should be extremely cautious in the industrial adoption of new ones. Let us consider these two aspects briefly.

For every structure there are certain conditions which are more trying to it than all other conditions, certain conditions which it fulfills with the greatest difficulty. Its ability to meet these most trying conditions is the measure of its industrial and commercial fitness, usefulness, and hence value. The fact that I cannot lay my hand with certainty on these conditions does not affect the truth of this proposition. We may not know these conditions to-day, but they are intrinsically discoverable. The supreme danger to the chimney may be the gale. The supreme danger to the rail may be the unduly rapid impact of an ill-balanced driving wheel when the ground is frozen hard, and after the head of the rail itself has been brought from its initial ductility to the vitreous state by the peening of the wheels. The supreme danger to the hull plate may be the dynamic stress along the rivet holes in a collision. That which at last breaks down the well-aligned factory shaft may be the inevitable slight variations of stress. In each case there are probably two or more supremely trying sets of conditions; but be they few or be they many, be they recognized or be they still undiscovered, there must in the nature of the case be such most trying conditions, the ability to endure which necessarily carries along with it the ability to endure all of the other conditions of use. It is to these most trying conditions that our tests should address themselves.

We assume reasonably that the ability to meet these most trying conditions will be measured most trustworthily by that test which reproduces these same conditions the most closely. For instance in the many cases in which the most trying stresses are dynamic, it is reasonable to believe that a dynamic test is fitter than a static one. Of course we should not leap to the conclusion that any and every dynamic test is here fitter than any and every static test.

Admitted Inadequacy of Present Tests

Here, then, is one direction in which most of our tests are very faulty. Their conditions are radically unlike the most trying ones of service. The light which they throw on the fitness of the object for its proposed service is most indirect. In that respect they are unfit tests.

An objection from a wholly different direction lies against most of our tests: the objection that, because they are tests to destruction, they cannot in their nature be applied directly to the object whose fitness they would gauge, but instead they must be applied vicariously to small pieces assumed to represent those objects. We do not test the individual rails, boiler plates, shafts, bridge posts, or concrete columns on whose fitness the lives of our fellows hang, but small pieces cut from them, or for some other reason assumed to represent them. In certain rare cases we do indeed test, not such a small fragment, but a similar whole structure, a like beam or shaft or post. This is not as bad as measuring the endurance of your recruits by finding what forced march suffices to kill their brothers, but it is open to the same kind of objection, the objection that because it is destructive it must needs be vicarious.

But a great range and variety of indestructive tests suggest themselves, tests which leave no more effect on the piece tested than seeing, tasting, or smelling it would. The presence of cavities may be detected through the density, and that of plastic deformation through the potential. Microscopic examination is already well advanced. Magnetic testing has received much attention; and electrical disintegration is now pointed out as a means of test. The number of physical properties which offer themselves as possible means of testing is very great.

Tests by Forces Which Leave the Body Tested Unchanged

Here we note that Miers and Isaac determine the supersolubility curve of solutions by measuring their index of refraction of light, and that Hönigsberg and Coker study the lines of stress by the behavior of polarized light passed through transparent specimens. What do these things mean? They mean that light, a manifestation of energy, in crossing these bodies undergoes a change; and the nature of that change teaches us concerning properties in those crossed bodies little related to light; or, in short, the action of the body tested upon a form of energy passed through it or reflected from it may be made to disclose and to gauge properties of that body but little related to that form of energy and with no residual effect on the body itself.

But light is only one of a considerable number of forms of energy which seem open to such use. Sound, electricity, the divers kinds of radiations which only lately disclose themselves to our amazement, and the many yet undreamed ones awaiting discovery; these are forms of energy some of which may be harnessable to a like use.

Let us remember that later our analysis of these subtler manifestations of energy will be even fuller than our present analysis of the coarse radiations of sound. As to-day we know not only the pitch and volume, but the timbre, overtones and harmonics of sound, so later shall we know corresponding characteristics and phenomena of these other kinds of radiation, so that we seem embarrassed by the riches of the variety of agencies from which the testing engineer of an age less crude than ours may choose.

Steel Tests by Indestructive Methods

Here lies the suggestion that we may learn the properties of the very rails and girders which we are to use, and later the properties of assembled structures themselves, such as boilers and bridge posts, and conceivably in the far, far future the assembled hull, by their action and re-action with some form of energy. Who shall say that the pitch or volume or timbre of sound emitted by a rail as the result of a given excitement may not be made to disclose pitilessly its hidden defects and to measure the fitness, not alone of the material of which it is composed, but of the rail as a whole structure? Or, giving rein to our fancy, we hear the inspector report, "This one-hundred-story building indeed responds to G-sharp, but its timbre has this abnormality and these harmonics are exaggerated."

These indestructive methods indeed have the defect of being indirect in one respect, to weigh against their advantage of being direct in another; they are indirect in that they gauge the properties actually needed in service by means of other properties; they are direct in that they may be applied to the very objects to be used, instead of vicariously to coupons or like objects to be destroyed in the test itself.

Their natural service seems to be to supplement the vicarious destructive tests. Thus the tester of the future may prove his material by the vicarious destructive tests of coupons, and prove his structures themselves by these indestructive tests.

It is not to imply that such means are of our decade or even of our century that I have hinted at them, but rather that we may put ourselves in the right attitude towards our art. It is well to climb at intervals from our details to the top of some lofty pyramid, and, looking afar, see how the brightness of the future contrasts with the darkness of our present unfathomable ignorance.

A Time of Great Progress

To our pride, to that God-given quality which in the last analysis has probably aided more than any other in

lifting us from apehood, it is indeed gratifying to look at our own time as a time of great perfection. Like the fly on the wheel, we enjoy reflecting that in our own day and that of our fathers' anaesthesia, the railroad, the telegraph, the sewing machine, the telephone, the wireless telegraph, and the flying machine have come, both poles of the earth have been reached, and the last important absolute monarchy has passed away forever. These are great and marvelous achievements, and each of us may be proud that in outward form he resembles those who have brought these things about. Still better, look around us and see on every side the accelerating substitution of the altruistic for the egoistic point of view; the rapidity of the spread of the conviction that our powers form but our stewardship; that, once our old age is provided for, we are bound to devote at least a large part of our energies, each of us in his own way, to the betterment of our fellows, be it through charity; through public service, or through scientific, historic or other form of learned investigation.

But if we would take the right attitude toward our art and its future, then, looking at once on the rapidity of this acceleration and on the immensity of the remainder of man's sojourn on the earth, our pride should be not in to-day but in being the fathers of the race to whose golden era millions of years hence our day is as midnight.

New Methods Inevitable, Yet Changes Must Be Slow

That our present state seems to us modern is nothing; every period in the last fifteen centuries has seemed modern to itself. If, remembering the wonderful progress, scientific, industrial, and social, in our time we admit that progress is accelerating; if from Fielding's photograph of life we infer that the progress in the 160 odd years since it was written has been as great as in the 1600 odd years which preceded it, and hence that the acceleration itself is rapid; if we then admit both that the acceleration will continue, and that man will continue to dominate the earth not for centuries but for millions of years; that the middle ages are not behind but far before us and we ourselves at the dawn of history; if we do this, we may gain some idea of the futility of imagining that we in this stream of progress ought to lie at anchor; and we may recognize that the methods which our present ignorance and crudeness have evolved are mere temporary makeshifts.

Let us remember that till very lately our most competent authorities have been unable to answer the elementary and readily answerable question, "Does a soft or a hard rail better resist abrasion?" The facts that such relatively modern marvels as the reciprocating engine and the Bessemer process seem already threatened and that the electric telegraph has already yielded much of its importance to the telephone and to radio-telegraphy, may help us to a right attitude, in which we concede that as to-day's makeshift testing methods are sure to be displaced some day by some new ones, the new ones offered to-day may be those which are to displace them.

On the other hand, the frictional resistance to the introduction of any new method of testing is so great, and the kind of mental and moral energy needed for overcoming this resistance is so limited in quantity and so precious to mankind, that we reasonably require the advocates of new methods to elaborate them, to put them into serviceable condition, and to provide convincing proof both that they are competent and that the form in which they are offered is reasonable and fit. Till then we can hardly be expected to urge their industrial adoption even as supplementary tests; and of course we cannot consider substituting them for existing tests till their competence and their advantages have been overwhelmingly demonstrated, so momentous are the interests at stake. Though we recognize the need of progress, we recognize also the need of scrutinizing most searchingly every contemplated step of that progress.

Gains in Numbers and Prestige

Having thus considered the purposes of our society, let us turn to some tangible evidence of the progress made in accomplishing them since our last congress. First, four additional countries are represented in our Council—Japan, China, Canada, and Brazil, by Messrs. Saito, Kwong, Hersey and di Paolo, bringing the number of countries represented on the Council up to 25. Second, our membership has increased from 2160 to 2680, or by 24 per cent., and now represents 30 countries and every continent. Adding the members for the present Congress year, our membership becomes about 3700. Third, in addition to the existing national societies closely affiliated with us in Germany, America, Italy, Austria and Hungary, two new national societies have arisen in Russia; and in addition to the existing organization of our own members into a racial group in France and Belgium, a like national Swiss group has formed. I appeal to the members of Council from other countries to institute like works. Perhaps by this means better than by any other can they discharge that solemn trust which they accepted in entering the Council.

That we are recognized not as a private club for our own benefit and enlightenment but primarily and essentially as a benevolent institution, successfully aiming to benefit mankind, an institution to which our contributions of time and thought are such as no sordid motive could evoke, is shown by the generous and widespread response to our appeal for aid in this work, and by the action of many governments and important public bodies in appointing representatives on our commissions.

Here it may be mentioned that the volume of papers for this congress is about twice as large as that of any previous congress.

The Council contemplates ways of lessening the impediments to the efficiency of our international committees, due both to the language difficulties and to the usual need of carrying on their deliberations by correspondence instead of face to face.

Lines of Evolution

The human hand in the early stages of its evolution was probably a fin for swimming. With diverging paths of evolution the fin became here a digging tool as in moles, there a flying tool or wing as in birds, bats, and some fishes and reptiles, and there a walking tool as in all quadrupeds. From a walking tool it became a grasping tool as in apes, and thence the unrivaled feeling, grasping, and guiding hand, which has played so indispensable a part in civilization. Though it is still of some use for certain of its older duties, swimming, walking as in childhood, and climbing, what interests us here is that in evolving it passed for aeons through stages in which it was wholly useless for its final duties. This is a frequent path of evolution. Providence bridges the stages in which the evolving organ is useless for its final purpose by giving the creature to which it belongs needs which it can then serve, and this temporary service may be wholly unlike its chief final service.

Thus too does Providence evolve the individual man or the organized group of men. Thus does the man who has developed with infinite pains and self-restraint a special skill or special knowledge for the immediate purpose of benefitting himself, of supporting his family and providing for his old age, find not only that he has been spurred on by these egoistic motives to developing that which is of value to mankind, not only that he who would serve himself well must serve his fellows better, but beyond this that his special skill and knowledge become, with changing environment, useful for purposes which he could not have foreseen. Little could Mushet have foreseen that in developing his special knowledge of the influence of manganese on iron he was prefitting himself to form an almost necessary link in the development of the Bessemer process.

The Broadening of Original Scope

Spurred on by the impulses through which the Creator leads us to initiate our work and mark out its boundaries, we are as the colt in the trainer's hands. We see the immediate result, the reward held out, the penalty to be avoided; we do not dream of the greater purpose lying hidden beyond our present vision. But when that greater purpose later opens before us we accept it in spite of not foreseeing it, as the warhorse rejoices to carry his rider through crashing charge to victory, unmindful of having been blind in the days of his training to the glory which awaited him. Let this thought impress us. Let us say with Emerson,

> The passive master lent his hand
> To the vast soul that o'er him planned.

It is because we recognize this as part of the Creator's plan that the broad-minded, as their powers mature, refuse to be bound by their initial forecast of the limits of their activity, a forecast which fitted their then narrower vision. As a new task offers itself only the narrow ask

"Is it part of my original plan?"; the moderately broad ask, "Is it to my interest?" The truly broad say, "Is it to the interest of my fellows? Then I accept it as part of the plan of the great Overplanner."

Specification Making Must Be Added to the Original Plan

Let us see if these considerations apply to ourselves. The immediate purpose before the founders of our society was to perfect and unify the methods of testing; the ultimate purpose was to enable the public to get fit goods. But if I am to learn whether my purchase is fit by testing it, I must know not only how to test it, i. e., how to measure its properties, but also how much of each property it ought to have. Of what use is a process for testing axles by impact or tension unless I know quantitatively what tensile properties they ought to have and what impact they ought to endure? Of what use are methods of testing without reception specifications? One is the necessary complement of the other.

It so happens that, in building a society fitted for the immediate end of improving methods of testing, we have simultaneously fitted it for the indispensable supplement, specification making. In bringing together those competent to improve methods of test we have also brought together those most competent to draw specifications. We have "builded better than we knew." We have unconsciously made an organization fitted for filling both needs of the public, for telling it both what properties, quantitatively, its purchases need and also how to measure those properties.

At the prompting of the unseen Master the founders of this society conceived a useful purpose. To Him they passively lent their hands, with the result that in building this structure under His guidance they unconsciously prefitted it to a still more useful purpose. If it is true that we are thus fitted, then it follows irresistibly that we have this duty, for our duties are co-extensive with our powers. Every power is granted to us as its custodians, not to hide it in a napkin but to exercise it.

I am not unmindful of the obstacles and pitfalls in the way of specification making. I understand the gravity of the commercial questions involved. I see that commercial interests may readily be antagonized into the position of resenting supposed interference. But let us look at obstacles as things primarily to be overcome and pitfalls as things primarily to be bridged, remembering that where there is a will there is a way; that the human beings with commercial interests on other continents do not differ in their innermost nature from the corresponding human beings on this continent; and that if it has proved possible to bring maker and user into harmonious and indeed enthusiastic co-operation here it ought to be possible there.

The American Society Has Made Specifications Prominent

As men of your sagacity are ever anxious to profit by the experience of others, I commend most earnestly to your attention this opportunity which your American visit offers to profit by the special experience of the American Society for Testing Materials, which stands to you in a relation of filial affection and pride. The natural development of the American society has happened to be in the direction of specification making. In our opinion, based on our now very considerable experience, this work has proved far more valuable, and of far greater profit to the public, than our simultaneous work of perfecting methods of measurement. Your visit here gives you an opportunity of judging the truth of this opinion, and, in case it shall seem to you true, the further opportunity of profiting by our experience in the methods to be followed and those to be avoided in this special work. Not less strongly do I commend to our American members this opportunity to learn from their foreign colleagues the work which they have found most useful, and the means which they have found most effective.

Recognition of Congress Committees

In closing this address I ask the members of the committees who have labored so zealously and so wisely to organize and carry on this congress and its excursions to rise and receive the thanks which, on behalf of the association, I give them from the bottom of my heart, and I ask their chairmen, Messrs. Clark, Holmes, Humphrey, Hunt, Marburg, Moldenke and Schmitt, and the officers of the sub-committees, Messrs, Chapman, Dunning, Hamburger, Kinkead, Kunz, Miller, Moisseiff, Stoughton and Wight, to express our gratitude to the absent members of their committees. Our warmest thanks are due also to our indefatigable secretaries,, General Secretary Reitler and Secretary Porter, for their most zealous and efficient labors.

Summation

Ladies and gentlemen, I have sought to impress on you that we are among the guardians of mankind; that our services to humanity are of so high a nature as to stimulate us to seek earnestly how we may make them more effective and wider; that one means is to supplement and in time replace our present methods, which rightly viewed are but temporary expedients, with better ones; but that this replacement, much as it is needed, should be made with extreme caution. Classing the methods of testing into the vicarious tests to destruction on one hand and on the other hand the indestructive tests applied directly to the objects which are to enter into service, I have pointed out that in the future these two classes of tests may well be used to supplement each other; that the vicarious tests should be made to reproduce as closely as possible the most trying conditions of service, and that the indestructive tests, with which we have hardly made even a beginning, hold out very wide possibilities of usefulness. I have urged on you our competence and our consequent duty to add specification-making to our original plan, and thereby to increase very greatly our services to our brothers, and through our brothers to our Father. Here are tasks which may well fire our imagination and stimulate us to an ardent consecration of our energies to the work of the International Association for Testing Materials.

Canada's Steel Industry and Market

TORONTO, September 2, 1912.—It is understood that another effort will be made to induce the Dominion Government to have recourse to bounties as a means of assisting the iron and steel industry. The directors of the principal steel industries in the country could easily obtain money to increase the capacity of their plants and further diversify their production if the Government would give the bounty policy another lease of life. The last of the steel bounties, that on the steel produced by electrical process, will shortly be at the end of its term, and the steel interests are unlikely to let the bounty system come to a finish without one more effort in its behalf.

That there is business in Canada for works collectively producing on a still larger scale than those now being operated appears to be proved by the very large imports of iron and steel. In the first three months of the fiscal year that began in April Canada imported 45,668 tons of rails from the United States, as compared with 14,547 tons in the corresponding three months of 1911. The imports of rails in the month of June were particularly heavy. In other items, such as structural steel, the imports go on increasing as Canada goes on constructing. The most discerning of the country's business men and public men see nothing ahead of the country but continuing prosperity and steady expansion. Population is increased from without at an annual rate of nearly half a million a year, and the immigrants bring an enormous amount of money into the country. United States emigrants, to say nothing of United States investors, bring probably enough money into Canada annually to wipe out the immense trade balance in the United States' favor. Railroad building shows no sign of abating. As settlement extends, as the pressure of freight increases, new routes are needed and are soon provided. It seems a certainty that the Canadian steel industry might have its capacity doubled and still find its maximum output to be below the measure of the home demand. In fact, the home demand will become more and more voracious, unless something unexpected occurs to arrest the progress of the country. Whether the Government can be convinced that it should do anything more to build up a steel industry remains to be seen. C. A. C. J.

The new open hearth plant now being erected by the Youngstown Sheet & Tube Company at East Youngstown, Ohio, is expected to be ready for operation in February or March.

Insuring Soundness in Steel Rails*

Further Steps Necessary to Guard Against Ingot Defects—One-Third Discard and a Test from Every "A" Rail

BY ROBERT W. HUNT.

While steel rails have been of great scientific and engineering interest from the day of their first experimental use, and much literature has been written upon them, there has never been a time, at least in America, when matters relating to their manufacture and service have received as much public and even governmental attention as during the past two years. I have been actively identified with the manufacture of steel rails from the rolling of the first commercial order for them in America up to and including the present time. As a steel maker I became thoroughly familiar with the theoretical and practical details of the business; and later, as a consulting engineer and inspector of all steel products, and especially of steel rails, I have endeavored to keep in touch with and cognizant of everything relating to the art.

All steel rails are made from steel ingots. Steel ingots are formed by pouring or casting liquid steel into cast iron ingot molds. The larger the cross section and the greater the length of the ingots, the greater the difficulty in obtaining sound castings, i. e., sound and homogeneous ingots. Without sound and homogeneous ingots it is impossible to produce sound and homogeneous rails; and, unfortunately, the most important unsoundness will be first in the center of the ingot, and last in the center of the rails produced from it, where it is frequently impossible to detect without destroying the rails. The large tonnage in each heat of rail steel (whether made in Bessemer converters or in open-hearth furnaces) under present mill practice, necessitates the casting of ingots of large cross-section and long enough to make several rails.

Defects Accompanying Modern Mill Practices

It is a long-known fact that the greater the mass of steel in a casting, the greater the tendency of the metalloids (carbon, phosphorus, sulphur and silicon, and particularly the hardening metalloids phosphorus and carbon) to segregate at the part of the casting where the metal remains longest liquid, which, under normal conditions, is at the center and toward the top of the mass. Again, it has long been known that the necessary cooling of the metal from the outside inward causes a contraction which results in the formation of a cavity or "pipe," which defect is increased by hasty and uncontrolled casting of the molten steel into ingot molds. Over twenty years ago Robert Forsyth, then chief engineer and manager of the Union Steel Company, Chicago, Ill., demonstrated that if rail-steel ingots were laid on their sides before the interior steel had set, the pipe would not be formed in the middle of the top end of the ingot, but upon the upper side and liable to extend toward the bottom end; and that, therefore, ingots should be left standing in a vertical position until the interior metal had solidified. (Journal of the Franklin Institute, Vol. 127, May, 1889.)

Much time, labor and money have been expended in seeking to overcome the piping and segregation in ingots without greatly increasing the cost of production through expense of operation, lessening product, etc. Technically several of the schemes have given good results, but they require increased cost of manipulation, and, most serious of all, more time. Unfortunately for success in casting sound ingots, modern practice has been in the direction of larger heats of steel, and it is easy to appreciate that with a casting ladle containing up to 100 tons of liquid steel, much if any control of the stream flowing through its nozzle is an impossibility. Therefore, the soundness of the resulting ingots is a matter entirely independent of the personal skill of the workmen. However, while the efforts to produce sound ingots have not been generally commercially successful, I am loath to believe that the difficulties will never be overcome. Such has not been the spirit under which the great successes of the past were accomplished, and I do not think it now exists. If a positive necessity for sound ingots be commercially established, a commercial way to produce them will be found.

A One-Third Discard Predicted

As the general existing conditions produce ingots with the most undesirable steel in their upper part, it has been and is the practice in manufacturing steel locomotive tires, ordnance forgings, armor plate, large steel shaftings and other what are termed high grade products, to reject arbitrarily at least the upper one-third of the ingot. It is true that even so great a discard will not always prove an absolute safeguard, but if the ingots are carefully made it will do so. Against bad or ignorant workmanship it is hard to find any absolute protection.

In rail purchases it has been found impractical to secure so great a discard. Personally, I believe the future will bring it, unless the insistence upon it shall lead to improved methods in casting ingots; until that time comes, I think that, through the railmakers developing other uses for the discarded steel, the decided increase of cost will be avoided.

Experience has proved that rails made by the basic open-hearth process are more liable to have interior pipes and segregated spots than Bessemer rails; no doubt principally because the ingots are larger and the size of the

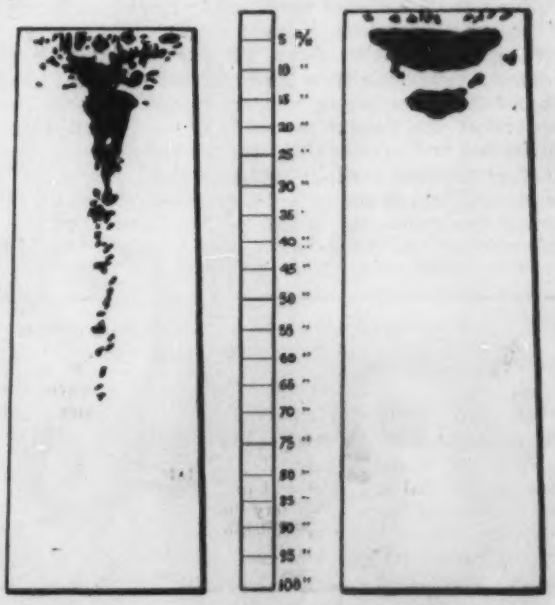


Fig. 1 Fig. 2
Showing Different Depths of Piping in Ingots from the Same Heat

heats prevents slow casting. Of course the smaller contained percentage of phosphorus lessens the danger from its segregation, but the greater carbon content made possible by the low phosphorous increases the segregation of that element.

Progress Made, but There Must Be More

Intelligent and careful investigation by a committee of the American Society of Civil Engineers, of which I had the honor of being secretary, resulted, August 3, 1893, in the recommendation of a series of rail sections which, while not adopted by all American railroads, were used by so great a number that they became accepted as standard sections. In 1902 another committee was appointed by the same society, of which also I was secretary. That com-

*Presented at the Sixth Congress of the International Association for Testing Materials, New York, September, 1912.

S. DIESCHER & SONS,
Mechanical and Civil Engineers,
PITTSBURGH, PA.

mittee, while deciding not to recommend any changes in rail sections, did present certain specifications governing the manufacture of rails. Later developments resulted in that committee asking to be discharged in favor of one more directly representing the railroad organizations of the country; and this committee (American Railway Association Committee) recommended, under date of March 23, 1908, a series of rail sections which have, to a certain extent, displaced the so-called American Society sections; and, in my judgment, wisely so. The same committee has recommended rail specifications; several railroad companies have adopted their own, and the rail manufacturers have what are known as Standard Specifications, all seeking to secure good-wearing and safe rails. All of this has been accompanied by much discussion, and I know has resulted in much good; but we are still away from the desired certainty of safety.

I believe we can afford to let the chemical requirements remain as they are in most of the specifications. Their physical requirements as to finishing temperature also are sufficient, and most of them provide for sufficient drop-testing so far as determining the quality of the steel of the several heats as metal; but they do not go far enough to give protection against unsound castings (i. e., ingots). Practically all specifications require that the testpiece shall be taken from the upper end of the rail made from the top of the ingot; and several require that after drop-testing if the piece has not broken it shall be nicked and broken to expose the interior, and if the interior of the rail shows any defects all of the A or top rails of the heat shall be rejected.

A Test Piece from Every Top Rail

So far, so good. But each ingot is an individual or separate casting; and because one is sound, it does not prove that the others (say 4 in Bessemer or 29 in open-hearth practice) are also good castings. As showing what does happen, I give diagrams (Figs. 1 and 2) of two ingots which were cut longitudinally through their centers. With such variation as here shown, it follows that the testpiece from one ingot would not be representative of the other one. Therefore, I favor drop-testing as now, and nicking and breaking those testpieces, and also a piece from the rails made from the upper end of each and every one of the other ingots, and accept the seemingly sound and reject the proven unsound A rails. And I would go further and provide that, where unsoundness is shown, another testpiece shall be cut from the lower end of the represented A rail and nicked and broken. If it also shows unsoundness, then the B rail of that ingot shall also be rejected, and another piece cut from the lower end of that B rail, and, if unsound, the C rails condemned; and so on for the remainder, if any, of the ingot. This makes a practical way of determining how far the pipe or segregation has extended down the ingot, with the minimum destruction of merchantable rail. Such a plan of testing is not entirely new in principle, and was in part suggested by the late William Metcalf in 1908, when he was consulted by the Rail Committee of the American Railway Association. The additional testpieces can be taken from the rail ends which are made in hot-sawing the rails, and can be broken under much less cumbersome tools than the drop-testing machine and at small cost.

As to what constitutes interior defects, I unhesitatingly specify not only laps or pipes, but also silvery or bright spots, or other indications of non-uniformity. Etchings and analyses of a great many examples of the latter have proven them to unfailingly indicate segregation. I give in Figs. 3 to 6 views of the sections of nicked and broken rails, and of the same pieces after having been polished and etched; also analyses of drillings taken from the indicated positions. I also give, Table I, the results of other analyses of such spots. These tell their own story.

TABLE I.—ANALYSES OF SEGREGATED RAILS.

Rail No.	Result of drop test	Kind of steel	Appearance of fracture on nick break	Appearance of etching	Chemical analyses—Mill ladle C.	Mill ladle P.	Drillings from center of web C.	Drillings from center of web P.
1	O. K.	Bess.	Segregated	Unsound	.45	.10	.691	.165
2	O. K.	Bess.	Segregated	Unsound	.45	.10	.634	.152
3	O. K.	Bess.	Segregated	Unsound	.46	.10	.666	.138
4	O. K.	Bess.	Segregated	Unsound	.48	.10	.761	.173
5*	O. K.	Bess.	Segregated	Unsound	.45	.10	.797	.173
6	O. K.	Bess.	Segregated	Unsound	.47	.10	.722	.142
7	O. K.	Bess.	Segregated	Unsound	.53	.10	.656	.145
8	O. K.	OH	Segregated	Unsound	.71	.029	.829	.043
9	O. K.	OH	Segregated	Unsound	.67	.040	.727	.059
10	O. K.	OH	Segregated	Unsound	.62	.022	.919	.042
11	O. K.	OH	Segregated	Unsound	.71	.039	.990	.060
12†	O. K.	OH	Segregated	Unsound	.64	.028	1.009	.057

*Analysis drillings from corner of head gave carbon .439, Phos. .063.

†Analysis drillings from corner of head gave carbon .646, Phos. .023.

Rails with segregated centers do not always fail under the drop test, nor does the elongation test which is required by some specifications indicate their existence, but, unfortunately, it has been demonstrated that rails with such hard centers fail through the softer surrounding metal breaking down and thus producing split heads and often broken rails.

Tie Plates and Splice Bars from Discard

I am fully convinced that, until sound ingots are commercially made, the safest procedure is to arbitrarily reject the upper part of every ingot for rail rolling. It has been

Fig. 3—Fracture Showing Evidence of Segregation Along Center of Web

Fig. 4—Same Piece as in Fig. 3 Etched

Analyses { Corner of head..... 0.721 C., 0.035 P.
Center of web..... 1.03 C., 0.067 P.

Fig. 5—Fracture Showing Evidence of Segregation Along Center of Web

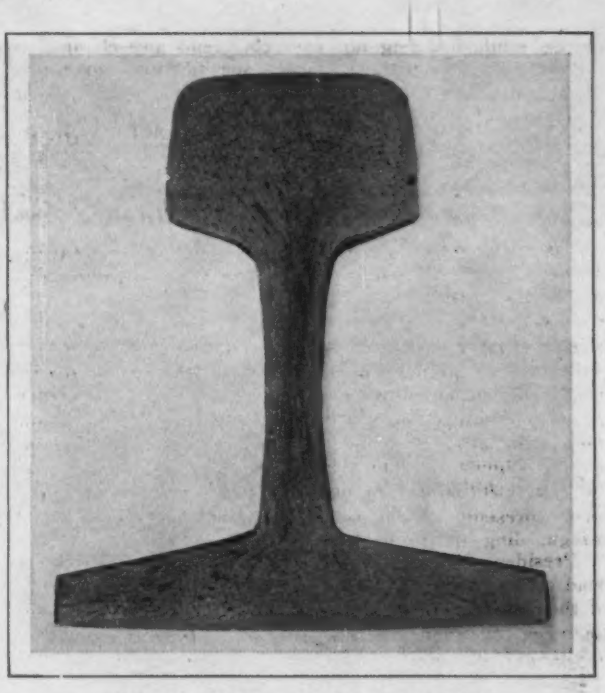


Fig. 6—Same Piece as In Fig. 5 Etched

Analyses { Corner of head..... 0.656 C., 0.024 P.
Center of web..... 0.888 C., 0.045 P.

demonstrated that high-carbon steel gives more satisfactory service in splice bars than softer steel; in fact it has been for several years the regular practice of some of the largest railroad systems to use such steel, their chemical specifications being practically the same for both rails and bars. Undoubtedly this harder steel would also yield good results in tie plates and where the danger of interior unsoundness renders this steel undesirable for rails, said unsoundness, when existing, would not of necessity make it unsuitable for either splice bars or tie plates. These two articles would furnish a place for the use of a large part of the steel contained in the greater discard in the rail practice. Obviously its use would revolutionize the splice plate and tie plate making, but there have been many metallurgical revolutions and all of them have tended toward the betterment of the iron and steel industry.

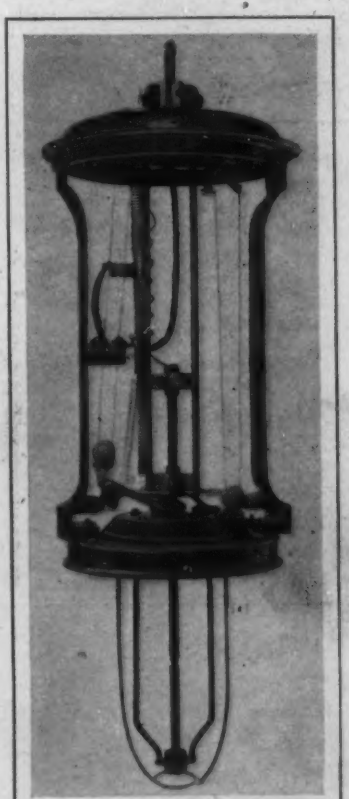
It may be that present and future railroad practice will require rails of heavier and otherwise different sections from the present ones, but we can never escape from the necessity of having them physically sound. As the section is increased, so must the work of rolling it decrease, and thereby the evil effects of want of homogeneity and unsoundness be augmented.

An Improved Arc Lamp

Use is made of the expansion of a wire by heat to control the light in an improved type of arc lamp which has recently been placed on the market by the Charles C. Hughes Company, 628 Race street, Philadelphia, Pa. The lamp will burn equally well on a direct or alternating-current circuit and is especially adapted for factories and other uses where direct current is available during working hours from an isolated plant, but whenever it should be necessary to light the plant after regular hours the current is taken from the alternating-current supply mains of a central station, as is also the case when the factory plant is closed down for any reason.

The wire used is of a special composition which was discovered after considerable experimental work and is such that the continued expansion and contraction does not cause a variation in its length. When the current is first turned on the wire expands sufficiently to form a good arc, and when the carbons burn away the flow of current decreases and the wire contracts. This shortening in its length trips the carbon clutch and feeds the carbon. It is pointed out that the elimination of the dash pot and magnets has done away with a source of expense and annoyance, as well as the trouble that arises from vibration, which sometimes breaks the arc and frequently causes the light to flicker.

A non-corrosive metal is used for the interior parts of the lamp, so that the trouble caused by corrosion is done away with. This enables the lamp to be used in places where acid or other fumes and vapors cause trouble, such as in chemical plants and railroad roundhouses. It is pointed out that the construction of the lamp is such that any fluctuation in the voltage not exceeding 25 per cent. does not affect the operation of the lamp in any way, the only difference being in the amount of illumination. This, it is emphasized, is a desirable feature in places where voltage fluctuations are unavoidable on account of heavy intermittent loads being thrown on the circuit. The efficiency of the light and the life of the carbon is the same as any inclosed arc lamp, and for the same power consumption the candlepower is said to be much higher and the light steadier. Another important feature about the lamp is that it can be used for any frequency of alternating current from 25 to 140 cycles without any change in its construction



A Non-Magnet Type of Arc Lamp with the Carbons Regulated by an Expansion Wire Made by the Charles C. Hughes Company, Philadelphia, Pa.

The president of one of the greatest copper consuming concerns in this country is thus quoted: "Never before in my long experience in the brass manufacturing business have I known of more active conditions. The demand for finished products is on a huge scale. Never before have the wheels of industry been more actively employed."

Bridgeport Screw Company's New Factory

Manufacturing Efficiency Sought Through Plant Design and Equipment and the Hygienic Surroundings of Employees—A Problem of Window Curtains

The new plant of the Bridgeport Screw Company, Bridgeport, Conn., which recently began the manufacture on a large scale of wood screws of all descriptions and is about to establish a department of corresponding proportions for the manufacture of screw machine products, affords an exceptional opportunity for the study of the progress that has been made in recent years in factory design and equipment. In the manufacture and the handling of the product, from the receipt of the raw material to the shipment of finished screws; in the elements of lighting, ventilation, heating and fire protection, the factory represents the latest word in efficiency and in the safeguarding of the health and comfort of employees.

President W. H. Farrell, the founder and executive head of the business, has given to the design and erection of the factory the benefit of a long and successful manufacturing experience, which includes the erection of great works and the conversion of old into modern plants. The new structure will be given up to the wood screw department; the manufacture of machine screw products will be confined to another building which was included in the purchase of the land.

General View of the Second Floor, Showing the Massive Construction, High Ceilings and Broad Glass Areas of Walls and Monitor

The business is not based upon an established industry; it is entirely new. The equipment is strikingly homogeneous, consisting of the latest types of open and solid die headers and of a multitude of shavers and threaders of latest models, in the design of which are embodied modifications, specified by the purchaser, based upon experience in the works of the Dominion Wire Mfg. Company, Montreal, Canada, of which Mr. Farrell was the head in the period of its quick development to its present high production basis. From it were recruited to a large extent the administrative and mechanical heads of the Bridgeport factory. Although manufacturing began only 6 months ago, the equipment already installed is producing upward of 7000 gross per day, and with the delivery of machines under order this output will be increased to about 14,000 gross. As the manufacturing plans of the company include a full time run of 300 days, the yearly product figures at more than 4,000,000 gross.

The new factory is 70 by 300 ft. in plan, with an ell 50 ft. square. Its location is exceptionally good, as it lies adjacent to the main line of the New York, New Haven & Hartford Railroad. A spur track enters the yard, allowing cars to pass to a long exterior loading platform from which three broad doorways afford entrance to the storeroom and shipping room. There is land for ample enlargement in the future. The whole property, with the exception of one corner occupied by a dwelling house, is inclosed by a woven wire fence, surmounted by barb wire. It is absolutely unscalable and with the locking of the gates at the factory entrance and at the spur track completely excludes outsiders. The fence serves an ornamental purpose, framing the picture of a fine building and well kept lawns. The combination constitutes an important advertising factor, for the impression conveyed to the passer-by on railroad train or otherwise naturally includes the interior of the factory as containing equal orderliness, with corresponding efficiency. Also, the outlook from the building itself is pleasant and restful.

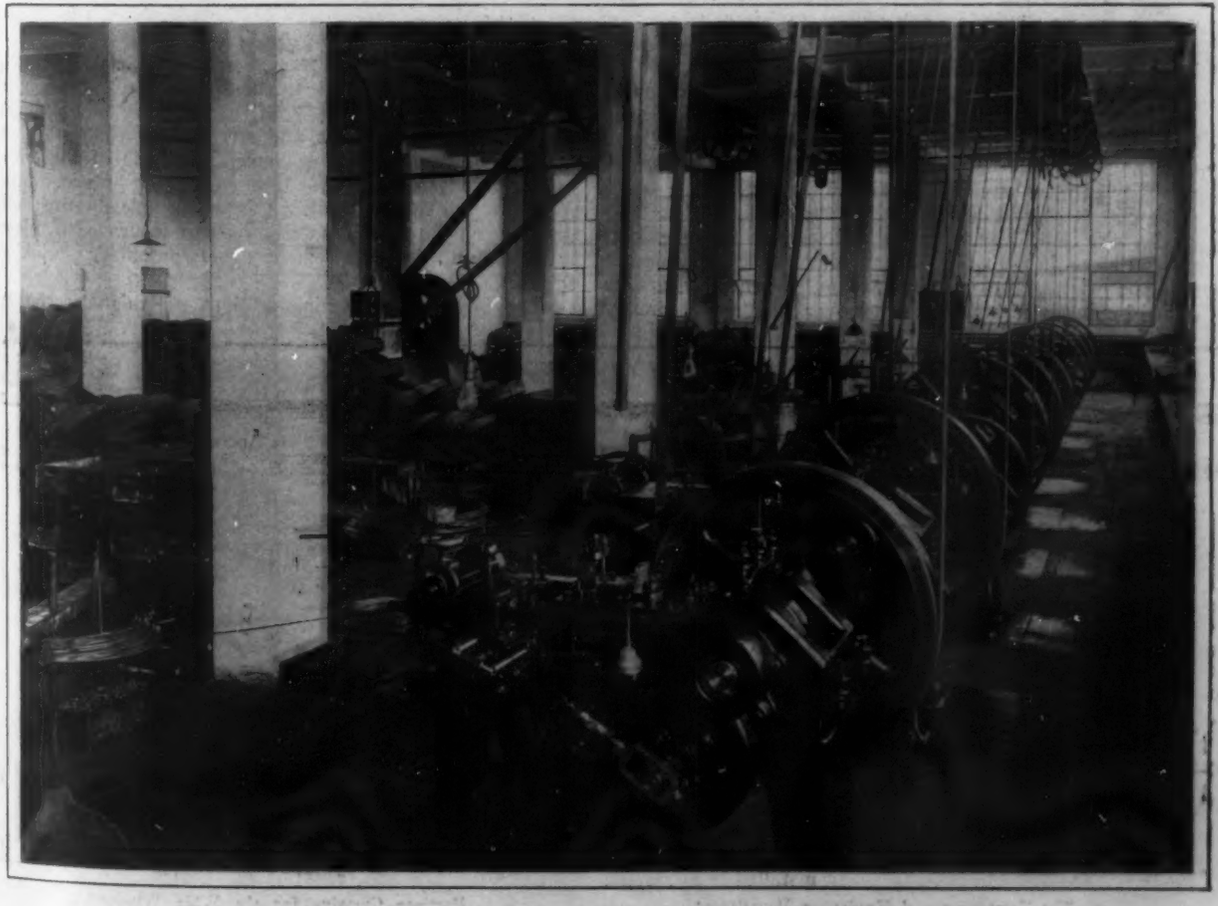
With the exception of the offices at the south end of the first floor and the ell, the factory consists of two rooms, each a great, high-studded hall. The first floor is given up to the header department, with its large group of machines; to wire storage and the stock room. The second floor contains the screw machinery proper, the cleaning department and the assembling, inspecting and packing benches, which are placed along the walls.

The power plant contains the heating boilers, including a high-pressure unit for furnishing steam to the cleaning department, and the transformers, which take the electric current at 12,000 volts and reduces it to 220 volts. The

Some of the Numerous Shaving and Screw Cutting Machines

machines of the factory are laid out in groups, each group driven by its own motor, constituting an elastic and economical method of operating. Power is purchased from a local company. In this room is also located the hardening and tempering department. On the floor above is the machine shop for the manufacture of dies, saws and other tools.

The exceedingly high rooms are a marked characteristic of the factory. The first story is 17 ft. from floor to ceiling, while the second floor has the same hight in the



View of the Header Department and a Glimpse of the Wire Storage

A Portion of the Stockroom

A Portion of the Stock Room

wings and is 24 ft. to the roof of the monitor, which covers 16 ft. of the width of the building. The window space is extraordinary, a feature which was made possible by the use of steel sashes. The standard width of window is 17 ft., and 3 ft. pilasters separate them. Of the nine sashes of each window, three are pivoted, swinging at the center, two in the bottom tier, one at the top. In addition to this provision for the circulation of air, the walls of the monitor are largely of glass, two windows out of three swinging open. The effect is of continuous tiers of windows encircling the building. Naturally the factory is flooded with sunlight, and swept with fresh air in warm weather and as desired in the colder months. The conditions are practically those of the out-of-doors, in sharp contrast to older works, and even to some plants of much more recent construction.

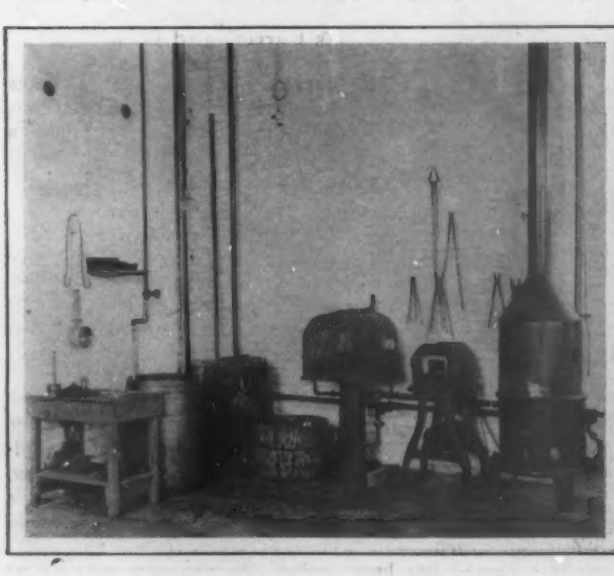
In fact, the problem of the modification of direct sunlight was an important one. The windows must be curtained, and the usual types of shades proved difficult of application to glass areas 17 ft. in width. The ordinary roll curtain of such a length and consequent weight would require a spring strong enough almost to lift a man from the floor, and constant adjustment and repair would be inevitable. The portière principle was applied to the factory windows, with results which have proved eminently satisfactory. A section of galvanized iron pipe is set in brackets at the top of each window to take the rings affixed to curtains of unbleached cotton cloth. Along the bottom of the window is stretched a wire, upon which slide small rings fastened to the lower edge of the curtains. One end of the wire is held by a bolt-headed screw which works in an iron insert in the wall. The turning of the screw makes taut the wire. The curtains are pulled open or drawn closed by means of cords working over pulleys and manipulated together at one side. The white cloth shuts out the direct sunlight, filtering the rays without greatly reducing the illumination.

Good natural lighting means large economy in the power bill in the period of short days. In combination with the natural ventilation, it contributes in a large way to the health and contentment of the employees. Already the company has learned that men and women are anxious to obtain employment in the factory "because it is a good place to work in." Experience in manufacturing plants has demonstrated that factory environment plays an important part in the securing and holding of the best available labor; that trouble-breeding discontent is very often associated closely with dull, unpleasant and obviously unhygienic working places.

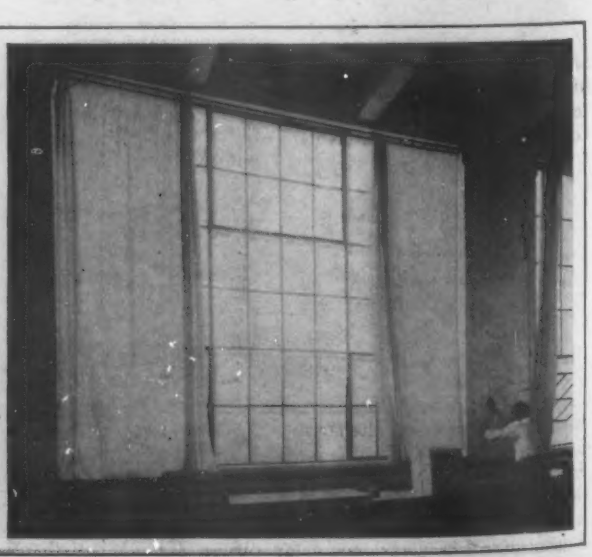
The summer has developed another source of profit on the investment in a building designed for comfort. When the extreme heat compelled many manufacturing establishments to shut down, this factory was as comfortable as any home to which the working people could go, and manufacturing was not interfered with in any way. The sanitation of the plant extends to the plumbing, of course, which is modern in every respect.

The building may be termed a mass of concrete from ground to roof. Floors, with the exception of a thin upper layer of wood, and walls, roof, heavy columns and stairways, are all of concrete and steel. The window sashes and the doors are of steel, excepting those of the office section of the first story. The storage racks are of the same material. The building is so completely fireproof that the company receives the lowest fire insurance premium rate, without the requirement of an automatic sprinkler system.

The problem of heating a plant of this description



The Tempering and Hardening Department



Portiere Curtains for the Wide Windows

possesses some difficulties. The original plan was to use radiators throughout, set at the pilasters between the windows, 17 ft. apart. It was found advisable, however, to substitute to a large extent 8-pipe coils encircling the rooms at the base of the walls. The calculation was that the radiating surface of the coils and their headers, the latter extending well up on the walls, would more than make up for the radiators considered, but experience demonstrated that they were inadequate and it was necessary to supplement the radiation by a 3-pipe coil set about the lower wall of the monitor space of the second story.

In connection with the establishment of a new industry, the evolution of the manufacturing career of its founder is sometimes of exceptional interest in its relation to the future of the business. Such is the case with President Farrell. A wire man from young manhood, the greater part of his life has been devoted to tonnage products, but circumstances of his advancement as an organizer and manager have led to his gradual entrance into the manufacture of a highly specialized wire product which is widely separated from that of the tonnage mills.

Commencing as a young man with the New Haven Wire Company in his native city of New Haven, he went to the Oliver Roberts Company, Pittsburgh, and thence to the Salem Wire Nail Company, Salem, Ohio, as journeyman wire drawer. From Salem he was engaged as superintendent of the wire drawing department of the Kilmer Mfg. Company, then located at Newburgh, N. Y. Advancing to the position of general foreman of the Pittsburgh Wire Company, Braddock, Pa., he was promoted to superintendent in 1898. In addition to the duties of this office, he acted as superintendent of the Continental Wire Company, Granite City, Ill., near St. Louis. When the Pittsburgh Wire Company was absorbed by the American Steel & Wire Company, he was retained as superintendent. In 1899 he was engaged by the Union Steel Company to erect and operate the finishing mill at Donora, Pa., afterward the property of the United States Steel Corporation, and constituting one of the largest, most modern and cheapest producing mills owned by the company. While the Union Steel Company was under construction, the Page Woven Wire Fence Company, Monessen, Pa., operating open hearth, blooming and rod mills, in addition to the finishing department, went into the hands of the Union Trust Company, Pittsburgh, as receiver, which appointed Mr. Farrell manager for the receiver, and he operated the works, in addition to his duties with the Union Steel Company. By important savings in the operating and administrative departments, a large increase in earning power was shown, owing to which a reorganization was effected, with consequent success.

In 1906 he accepted the presidency of the Dominion Wire Mfg. Company, Montreal, and, wood screws being an important product, had the experience which resulted in the establishment of the Bridgeport industry. In 3½ years at Montreal, he remodeled the plant and by improved methods increased the output from 12,000 to 40,000 tons. The company was absorbed by the Steel Company of Canada in 1910, and Mr. Farrell remained as manager until March, 1911, when he resigned to undertake the construction of his new factory.

Between 7000 and 8000 employees of the Youngstown Sheet & Tube Company, Youngstown, Ohio, were granted a profit sharing bonus of 5 per cent. last week, based on the amount of wages of each for the year ended June 30. Nearly $250,000 will thus be paid to all employees except executive officers. While the profit the past year hardly warranted it, the directors felt that 5 per cent. should be the minimum basis of division.

The Machine Shop of the Bridgeport Screw Company

President Farrell Visits Farrell and New Castle.

Last week James A. Farrell, president United States Steel Corporation, together with other corporation officials and several officers of the Carnegie Steel Company, made a visit of inspection to plants of the company located at Farrell, formerly known as South Sharon, also Sharon and New Castle, Pa. A luncheon was given to President Farrell at Sharon on Thursday at which he made an address, saying, "The prospects before the iron and steel industry to-day are brighter than at any time in the past two years. Our export trade is increasing and much of the product of the mills in this vicinity finds its way abroad, but this business is one which must be consistently developed and which requires patient application."

He announced that extensions will be made to both the Sharon and Farrell works. At the former plant the work is to be diversified, which probably means the building of more open hearth furnaces. The sheet mill and wire mills of the Farrell plant will be enlarged. A fence post and gate mill will be built in connection with the field fence department.

Mr. Farrell has been elected an honorary member of the Commercial Club of Farrell.

Heavy Rotary Shearing Machine

A New Quickwork Tool for Cutting Boiler Plates

To meet the demand existing in almost every sheet metal working establishment for the cutting of irregular shaped parts without involving the expense of blanking

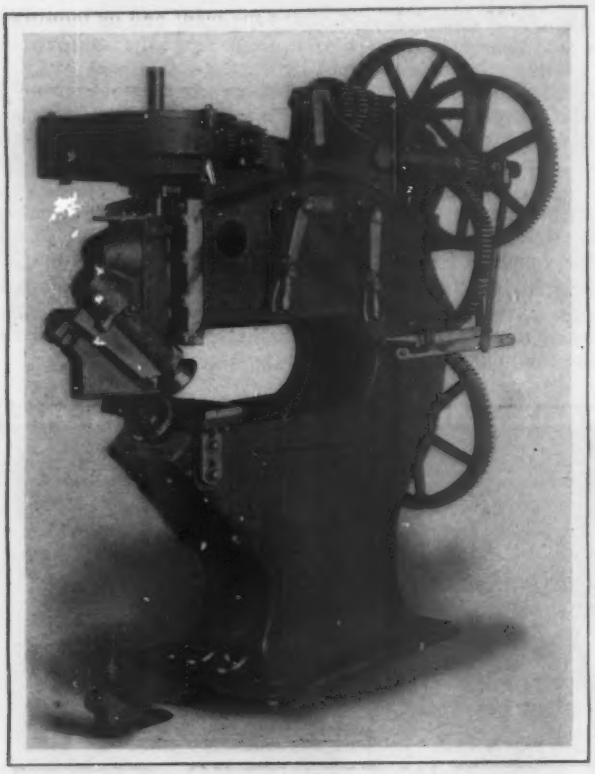


Fig. 1—The Quickwork Rotary Shearing Machine for Boiler Plate and Similar Heavy Material Built by H. Collier Smith, Detroit, Mich.

dies, H. Collier Smith, 125 Harper avenue, Detroit, Mich., has designed a heavy rotary shearing machine. This new machine is a development of the one which was illustrated in *The Iron Age* April 4, 1912. The previous machine was designed for light gauge work, while the present one will cut 3/8-in. steel to irregular or serpentine curves having a minimum radius of 4½ in., or it will also cut openings of any desired shape in the middle of a sheet without cutting in from the side. The maximum thickness of metal handled by it is ¾ in. It is pointed out that in the average plant which has to do with the cutting of sheet metal in a wide range of gauges, there are always a number of irregular parts to be cut, which, while they are not of sufficient quantity to justify the expense of purchasing blanking dies, at the same time require considerable expense and labor for their production with the usual equipment. Fig. 1 is a view of the new machine and Fig. 2 is the reproduction of a sketch showing the old and the new way of cutting curves in heavy metal and the saving in waste that is effected.

With this new machine the parts to be cut are scribed from patterns on the sheet as close together as the pattern shape will permit, and the cutting is done in one operation without any preliminary roughing. The metal is self-feeding through the cutters and comparatively little effort, it is emphasized, is necessary for guiding it in cutting to a line. Reverse curves can be easily cut, since both cutters are inclined with relation to the plane of the metal being cut so that they present similar and symmetrical rounded conical shaped adjacent faces to the cut edges of the metal, thus enabling the sheet to be guided either to the right or to the left and a cut made in either direction with equal facility. The upper cutter with its shaft and bevel driving gear is mounted in a gib casting, which is raised and lowered by a screw that derives its power from a worm and a worm gear. The forward pendant lever, Fig. 1, controls the raising and the lowering of this cutter, so that it is only necessary when cutting an opening in heavy metal to move the lever for raising the cutter sufficiently to permit the metal to be inserted and then move it in the opposite direction to lower the cutter through the metal. The machine is started and stopped instantly as may be desired by the manipulation of the horizontal handle to the right which controls the main drive clutch.

These machines have a variable-speed drive of the geared type and three speeds, which are instantly controlled by the rear pendant lever, are available. This mechanism consists of three pairs of gears which are always in mesh and a sliding key in the lower shaft that is shifted from one pair of gears to the other by the movement of this lever. The vertical travel of the gib casting carrying the upper cutter is controlled by an automatic stop mechanism which can be quickly adjusted to control the worm gear drive clutch so that the exact point to which the cutter must be lowered with relation to its mate to secure the best cutting results is governed automatically. A safety knock-out is also provided to prevent the casting from being raised high enough to jam in its uppermost position. There is also a supported hardened steel stripping table which is adjustable vertically. This is located across the machine behind and partly around the lower cutter and there is a tool steel faced stripper which is also adjustable up and down in front of and partly around the upper cutter. In this way the metal is guided in a horizontal position and the tendency of the cut metal to follow around the rear edge of the cutters, it is emphasized, is counteracted, thus making the guiding of the metal a comparatively simple matter.

The usual method of making irregular cuts, it is pointed out, entails a great loss in material and labor by reason of the necessity of allowing a considerable amount of extra stock in the preliminary roughing out of the parts, and then the final cut must be made piecemeal by cutting and punching or notching approximately along the line and finishing up the edge of the metal by chiseling or filing away the ragged or irregular corners resulting from the notching process. An example in the saving of the

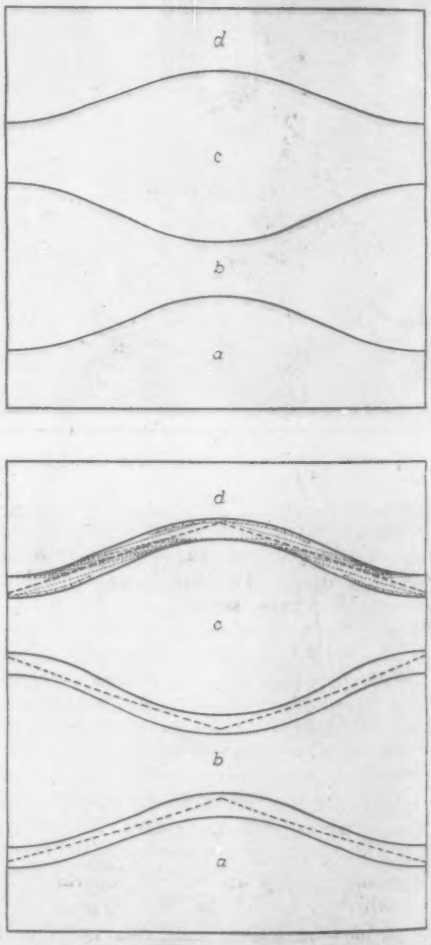


Fig. 2—A Sketch Showing the Old and New Ways of Cutting Curves in Heavy Metal.

amount of metal effected by the use of this machine is given in Fig. 2, which is the reproduction of an elbow, as that is a typical example of irregular cutting. The lower

portion of this cut represents a sheet of metal with four parts, *a*, *b*, *c* and *d*, respectively, scribed out on the sheet all ready for cutting in the usual way. Here it is necessary to scribe these parts some distance apart in order to be able to rough them out by cutting with a straight shear along the heavy dotted lines, after which the surplus metal is cut away a little at a time, as indicated by the light dotted lines, with a slotting punch. In the upper portion of this engraving the sheet of metal with the four parts scribed out on it ready for cutting with the Quickwork machine is shown, and it will be noticed that the parts are nested closely together without any space between, it being simply necessary to cut along the lines with the tool. This not only separates or roughs out the parts, but also completes them by one passage across the sheet and leaves a smooth, square edge and flat, true parts.

The Dodge Mfg. Company's Sixth Outing

Not an accident marred the sixth annual outing of the Dodge Mfg. Company, Mishawaka, Ind., at Springbrook Park, South Bend, Ind., August 22. Fully 3000 people attended. A moving picture machine did duty all day. It took excellent pictures of the Quarter Century Club as it entered the park grounds on a decorated auto truck headed by the Dodge Band. It also took pictures of the children's pageant and of the ball game in which several of the company's chiefs participated. These pictures will be shown later in theatres the country over. The Quarter Century Club is composed of employees of the company for 25 years or more. This club was the guest of honor of the company and enjoyed a dollar dinner in the Casino. Of its members Fred Yost, a woodshop foreman, has been with the company continuously for 31 years and Charles Endlich, the secretary-treasurer, 30 years.

The programme included sporting events, baseball, a vaudeville show and children's pageant (Dodge product exclusively), etc. The company leased the park for the day and the concessions were all free. Special trolley cars conveyed the people from Mishawaka to the park.

The bill posting contest was one of the most amusing features of the day. The contestants were M. W. Mix, president; E. H. Ahara, superintendent; W. B. Hosford, first vice-president; Charles Endlich, secretary-treasurer, and D. J. Campbell, general sales manager. The winners were E. H. Ahara, first, and W. B. Hosford, second. The Dodge News, of which C. R. Trowbridge, advertising manager, is the editor, filled with news and pictures and cartoons of interest to Dodge employees, was distributed during the day.

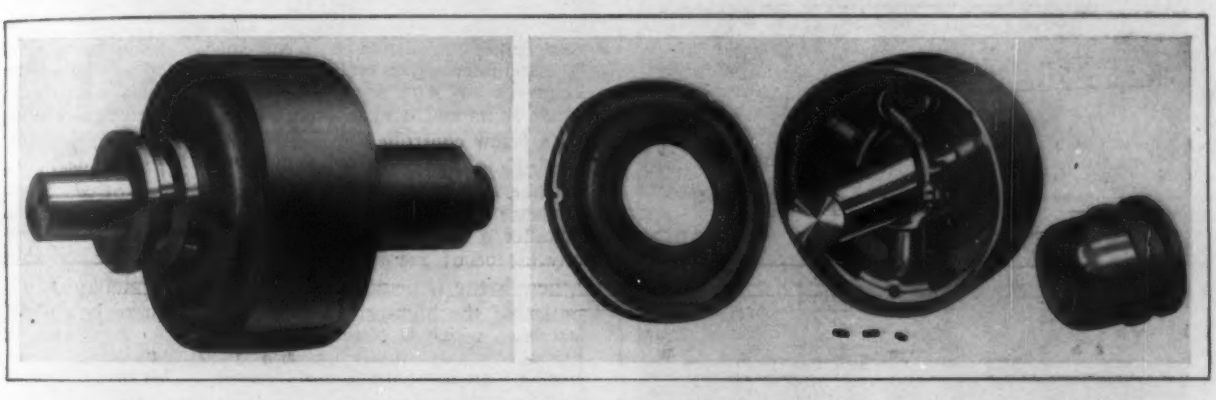
Pig iron production in the Buffalo district will be increased in the near future. Three of the four furnaces of the Susquehanna group are now in operation. The No. 2 furnace, which is out of blast for relining, will probably be ready to blow in about September 15. No. 1 furnace will then be put out of blast for relining and will be ready to blow in about December 1. At Tonawanda the two Niagara furnaces of the Rogers-Brown interests will be put in blast about October 1. One has been out since November, 1910, and the other since October, 1911.

A Novel Friction Clutch

A new type of self-oiling friction clutch that is a radical departure from the types at present on the market, has recently been brought out by the Cleveland Clutch Company, 224 High avenue, Cleveland, Ohio. The important features of this clutch are its simplicity and few parts, as outside of the set screws and pins it consists of only seven different parts. It is said to be adapted to all purposes and can be operated equally well at either high or low speed.

In the construction of the clutch there are no springs, shoes, toggles, cams, gears, joints or delicate parts to wear, work loose or get out of adjustment and no wood or fiber is used in its manufacture. There are no exposed parts, the working ones being entirely housed and protected from dust and grit, although they can be easily adjusted and quickly removed. The Cleveland clutch is built either split or solid in clutches and cut-off couplings. It has an extended sleeve of sufficient size to accommodate any standard wood or steel pulley and is equipped with a phosphor bronze bushing if desired.

The friction member is an expansion ring of semi-steel and inside of it is a cast-iron spider keyed to the shaft consisting of a driving arm and two other arms that support the ring. A driving pin of case-hardened steel wedges the spider against the expansion ring. The expansion of the friction ring is produced by a Bessemer steel cone which when inserted actuates two drop forged fingers held on a floating center. The point of contact between the cone and the fingers is just above the center and as the fingers are held on a floating center, their points expand on the same arc as the expansion ring. In order to take up wear the fingers have adjustable screws and lock nuts at the point of contact with the cone.



Two Views of a New Type of Friction Clutch Made by the Cleveland Clutch Company, Cleveland, Ohio

The interior of the casing forms an oil well to which lubricant is supplied through an oil hole on one side. The interior is oil-tight and it is stated that one supply of lubricant will last for months. The extended sleeve is lubricated by a wick fed from the oil well. The Cleveland clutch is said to be the only metal on metal one running in oil on the market. A film of oil has to be displaced before the clutch becomes thoroughly engaged so that it takes hold gradually and releases instantly. The clutch is not affected by centrifugal force and for that reason is adapted for low or high speed. Its construction permits it to slip under an overload without danger. The clutch is jig built so that all parts are interchangeable. Other advantages claimed for it are long life, easy adjustment to a given load, economy of space, perfect balance, great efficiency, smooth and positive action, silent running, plenty of clearance when the friction surface is disengaged and safety from injury by tampering or adjusting by unskilled hands.

Ten sizes of clutch ranging in diameter from 6 to 24 in. are made and at a speed of 100 r.p.m. the power transmitted ranges from 5 to 63 hp.

The general offices of the Philadelphia Steel & Wire Company have been moved to its Camden plant, at Pearl street and Delaware avenue, Camden, N. J. The wire and wire rope warehouse will remain at 525 Commerce street, Philadelphia, as heretofore.

S. DIESCHER & SONS,
Mechanical and Civil Engineers,
PITTSBURGH, PA.

New Cutting and Welding Process

The Use of Blaugas as a Substitute for Oxy-Acetylene Process

As a substitute for the oxy-acetylene process for welding, cutting and brazing, the Atlantic Blaugas Company, 381 Fourth avenue, New York City, is offering its Blaugas system. This gas, which is named after its inventor, Hermann Blau, a chemist of Augsburg, Germany, is claimed to be very well adapted for this work by reason of its very high heat value, a narrow explosive range and the ease with which it can be transported. Another important advantage claimed for this process of welding over the other autogenous welding systems is that the flame from the torch is broader, thus insuring a greater and more uniformly heated area of metal to be welded. The apparatus supplied by this company is illustrated in Figs. 1 and 2, the latter being a sectional view of the apparatus which gives the details of the arrangement of the various parts. The use of the gas is shown in Figs. 3, 5 and 6, which are respectively the welding of a broken automobile chassis and two views of the cutting of structural steel. These last two engravings illustrate the use of Blaugas in the ruins of the Equitable Life Assurance Building, New York City, which was destroyed by fire in January of the present year. This gas was employed for cutting the wrecked steelwork, a partial view of which is given in Fig. 4, so that it might be removed.

Fig. 1—The Apparatus for Welding, Cutting and Brazing Made by the Atlantic Blaugas Company, New York City

Blaugas is a compressed, liquified gas produced by distillation from mineral oils and in the process of its manufacture the gas is reduced to 1/400 of its volume. The gas is shipped in steel bottles, as shown in Fig. 1, that contain an average of 20 lb. of liquid gas, which will when expanded deliver 250 cu. ft. of Blaugas at the torch. The cost of the gas is 10c. per lb., which makes the cost per cu. ft. 0.8c., and each cubic foot of the gas has a heat value of 1800 B.t.u.

Referring to Fig. 2, the apparatus furnished consists of a steel cylinder, *a*, which is also shown at the right of Fig. 1, an expansion tank, *f*, Fig. 2, which is the white tank in the middle of Fig. 1, and a cylinder filled with oxygen, *n*, Fig. 2, which is the one at the left of Fig. 1. The cylinder valve *b*, Fig. 2, is connected by the stirrup connection *c* with the copper pipe *d*, which has a solid block at its end, and is clamped against the cylinder valve by a screw controlled by a handwheel. Between the block and the cylinder valve a fibre ring is employed as a washer. The check valve *c* at the inlet of the high-pressure regulator allows the gas to pass only from the cylinder *a* to the high-pressure regulator *e*, and prevents any escape of gas from the high-pressure regulator when a new bottle is being connected to the apparatus. At the outlet of the high-pressure regulator *g* there is a needle valve, *u*, which is connected by the rubber hose *h* to the preheating torch *i*. This torch is constructed along the lines of an ordinary bunsen burner. The Blaugas enters the torch through a little tip in the center and air is sucked into the torch through a number of holes in the valve. The pressure gauge attached to the high-pressure regulator *k* indicates the pressure in the rubber hose *l*. A combined needle and check valve, *v*, between the regulator and the rubber hose, allows the gas to be shut off and also prevents any gas from passing into the reducing valve from the rubber hose *l*. The pressure in the oxygen cylinder *n* is indicated by a high-pressure gauge between it and the high-pressure regulator *p*, which is also equipped with a gauge that indicates the pressure at the outlet side of the regulator. The combined needle and check valve *v* at the outlet of the regulator *p* permits the oxygen to be shut off and prevents the entrance of gas into the reducing valve from the rubber hose *q*.

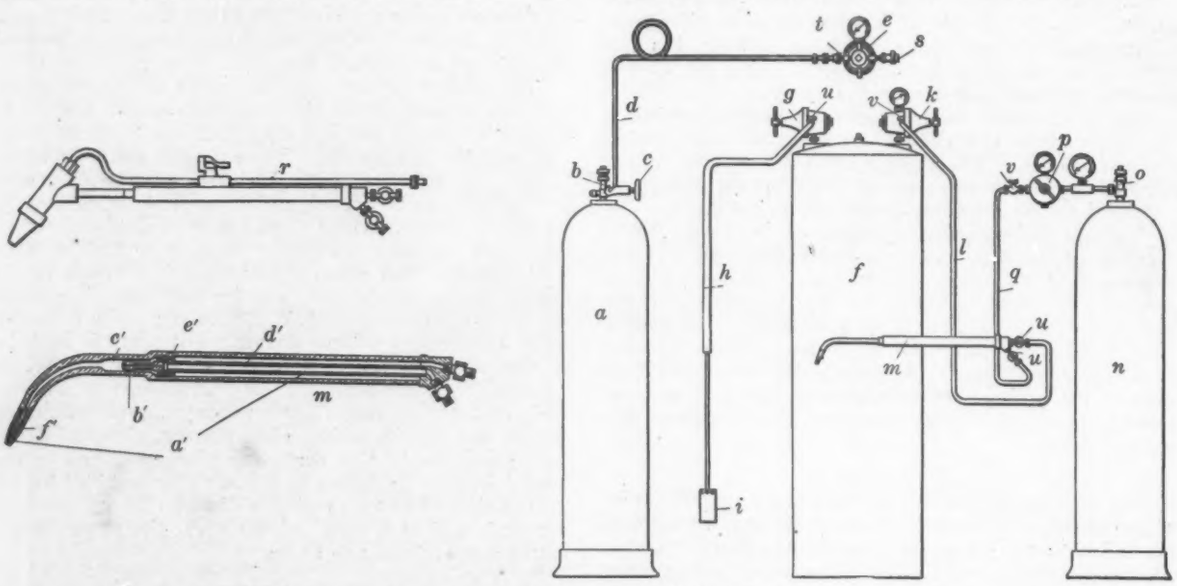


Fig. 2—View of the Apparatus Giving Details

The welding torch *m* is equipped with two small needle valves, one at the inlet for the Blaugas from the rubber hose *l*, and the other at the inlet for the oxygen from the rubber hose *q*. These valves permit the Blaugas and oxygen to be shut off and also facilitate the final adjustment of the pressure employed in the welding torch. The oxygen passes through the inner tube *a'* and the tip *b'* into the mixing chamber *c'* while the Blaugas passes through the outer tube *d'* and the little channels *e'* into the mixing chamber. The cutting torch *r* is of the so-called concentric type and the cutting-by pass is equipped with a spring cock which is opened as soon as the circular heating flame has brought the iron to the melting point. Five mouthpieces *f'* are furnished with the welding torch to be used for various thicknesses of metal. The welding process is the same as the ordinary autogenous welding process, sticks of steel, cast iron and aluminum being used for the respective metals. Fluxes of the ordinary type are also used.

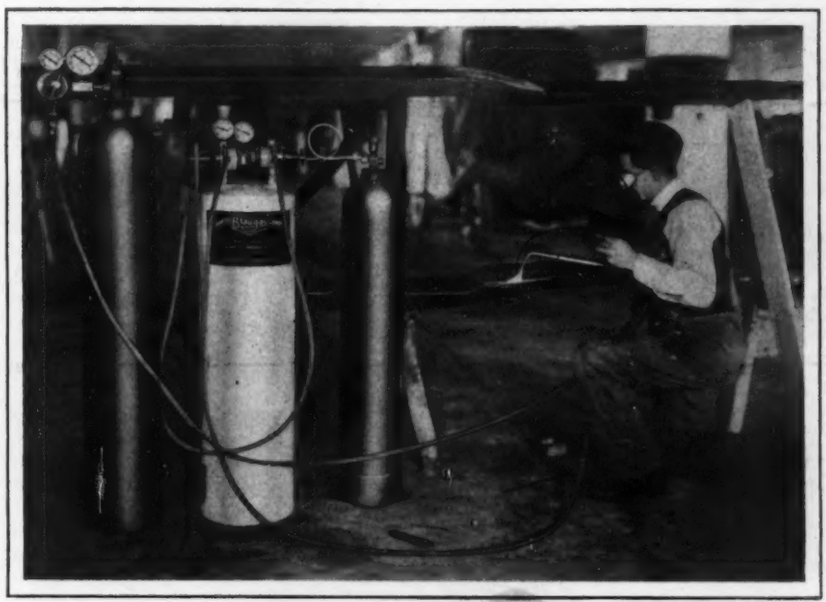


Fig. 3—Welding with Blaugas

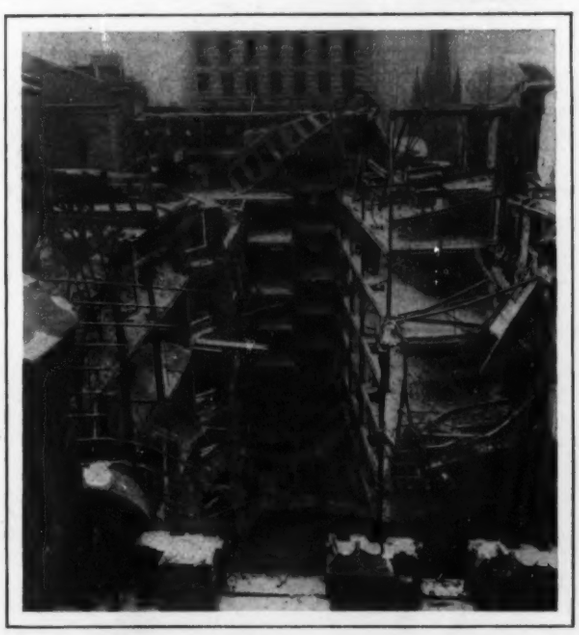


Fig. 4—View of the Interior of the Equitable Life Assurance Building After the Fire of January 9, 1912, Showing the Mass of Wrecked Steelwork to Be Cleaned Away

After the apparatus has been installed the valve of the gas cylinder *a* is opened to its full extent and the high-pressure regulator *e* is adjusted so that the expansion tank *f* is always filled with a pressure of from 50 to 60 lb. per sq. in., this pressure being indicated by the gauge above the regulator. To light the flame of the preheating torch *i* the regulating screw of the high-pressure regulator *g* is turned in and the needle valve *u* at the outlet of the regulator opened. The size of the flame can be adjusted by manipulating the regulating screw or by using the needle valve, the latter being the way recommended. Before the welding torch is used the high-pressure regulator *k* is adjusted so that the pressure gauge registers from 10 to 20 lb. and the high-pressure regulator *p* at the outlet of the cylinder *n* is adjusted so that its gauge shows from 15 to 30 lb., according to the thickness of the metal being welded. The needle valve at the outlet of the pressure regulator *k* is opened wide and the needle valve between the rubber hose and the welding torch *m* is slowly opened and the gas lighted. The needle valve at the outlet of the high-pressure regulator *p* is now opened and the needle valve between the rubber hose *q* and the welding torch *m* is opened gradually until the cone which is in the flame has a whitish-blue appearance.

The following table gives the various properties of Blaugas as compared with hydrogen or acetylene:

	Hydrogen.	Acetylene.	Blaugas.
Heat value per cu. ft., B.t.u.	425	1,500	1,800
Contents of a container having a capacity of 1 cu. ft. of water, cu. ft.	120	100	300
Weight of containers required to transport 540,000 B.t.u., lb.	1,060	432	100
Price per cu. ft., cents	0.6	0.5	0.8
Range of explosibility, per cent	56.8	47	4

Acetylene produced from calcium carbide on the premises has not been included in the above table. Calcium carbide is sold at approximately 3½c. per lb., and this quantity will produce 4½ cu. ft. of acetylene gas, each of which yields about 1500 B.t.u. To produce 100,000 B.t.u. in this way it would require 66.6 cu. ft. of acetylene or 14.8

Fig. 5—Cutting One of the Steel Girders in the Equitable Building with Blaugas

Fig. 6—Another View in the Equitable Ruins

lb. of the carbide at a cost of 51.8c. To produce this same number of B.t.u. with Blaugas will require 55½ cu. ft. of expanded Blaugas or 4.4 lb. of the liquid, which costs but 44c.

Seeing How American Ingot Iron Is Made

On Tuesday, August 27, the Master Sheet Metal Workers' Association of Cincinnati, Covington, Newport and vicinity visited the plant of the American Rolling Mill Company at Middletown, Ohio. There were approximately 125 in the party, brought by special train over the Cincinnati, Lebanon & Northern Railway from Cincinnati direct to the East Side plant.

After an address of welcome at the entrance of the plant by G. M. Verity, president of the company, the party was divided into groups, each given a guide and shown over every part of the mill. The process of manufacture of the rust-resisting iron of this company, known as American Ingot iron, was fully explained. Not the least interesting department covered in this visit was the research laboratory, where comparisons were shown between American Ingot iron and ordinary commercial steel. This laboratory is claimed to be the best equipped iron and steel research laboratory in the United States.

After a lunch at the Elks' Temple the visitors enjoyed an illustrated lecture on American Ingot iron, special attention being given to American Ingot iron terne plate, as this material is now a very popular product of the American Rolling Mill Company with sheet metal users. At the close of the visit the party returned again by special train to Cincinnati.

The Alabama Consolidated Coal & Iron Company, recently placed in hands of receivers, has been made defendant in an action brought by the State of New Jersey, charging violation of the corporation laws in connection with an issue of $3,500,000 bonds. Attorney General Wilson of New Jersey asks the court to require the company to answer by what right it exercised the privileges under which the bonds were issued. The company is a New Jersey corporation with $3,750,000 authorized capital stock. It has issued three series of bonds, namely, $500,000 first mortgage 6 per cent. bonds, of which $406,000 are outstanding; $3,500,000 30-year 5 per cent. bonds, involved in the State suit, and $5,000,000 refunding and improvement first mortgage 50-year bonds, practically all pledged with the Baltimore Trust Company to secure debts.

The water competitive freight rate on pig iron between Virginia points and Philadelphia was to have been advanced 20 cents per gross ton September 1, but the Interstate Commerce Commission has suspended until December 30, 1912, the proposed new tariffs of the Chesapeake & Ohio and Norfolk & Western Railroads. Heretofore these roads have published two sets of rates on pig iron from Virginia to Philadelphia, one applicable via Hagerstown transfer or Shenandoah Junction, W. Va., the other via Norfolk. The rate via Norfolk was 20 cents per ton less than via other junctions.

A Small Gap Lathe

A new size of gap lathe having a swing of from 11 to 15 in. has been brought out by the W. F. & John Barnes Company, Rockford, Ill. This tool, which is designated as the builder's No. 5 gap lathe, is a screw cutting lathe equipped with compound rest and off-set tailstock, thus enabling the compound rest to be set parallel with the bed. It can be furnished in either of two styles to be driven from an overhead countershaft through a belt connection or by foot power, as illustrated in the accompanying engraving.

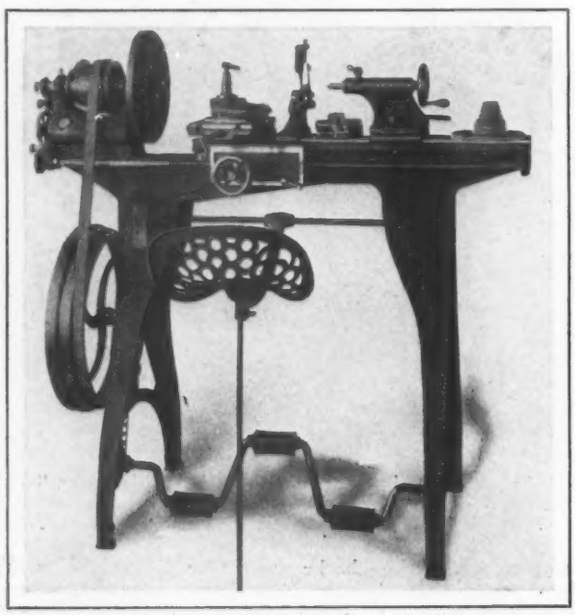
The headstock journals are accurately fitted to the spindle and means are provided for keeping them true and also for taking up wear. Both the head and tailstock spindles are of steel with taper holes for the reception of the centers, that for the tailstock being self-discharging. The tool carriage is designed so as to be both convenient and accurate in operation and gibs are employed for fastening it to the bed. To enable the work to be clamped for boring and milling operations, a number of T-slots are cut in the compound table.

Care has been taken to protect the working parts from chips and dirt so that long life and durability of the essential parts of the lathe are insured. Different numbers of threads, from 4 to 40, either right or left hand, can be cut as an ample set of gears are furnished and in addition many threads not mentioned on the index plate can also be cut. All of the gearing is cut from the solid metal and it is emphasized that it is practically noiseless in operation.

The following table gives the principal dimensions and specifications of the lathe:

Swing over bed, in.	11
Swing over tool carriage, in.	6⅝
Swing in gap, in.	15
Width of gap, in.	5
Distance between centers, in.	29
Diameter of hole through spindle, in.	15/32
Net weight, lb.	500
Boxed shipping weight, lb.	650

The equipment of this lathe is the same as the builders' regular No. 5 lathe, so that fixtures such as drill pads and centers can be interchanged between the two different



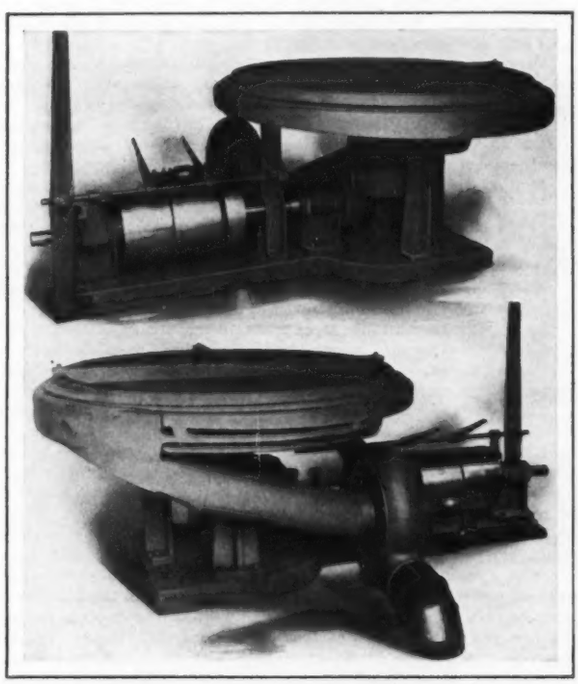
The No. 5 Gap Lathe Having a Swing of 11 to 15 In. Built by the W. F. & John Barnes Company, Rockford, Ill.

styles. This lathe is made with one length of bed and in one style only, but it is possible to operate it either by foot power or a belt connection from a countershaft. If the latter method is employed the builder is prepared to furnish a friction clutch countershaft having pulleys 9 in. in diameter with a 2-in. face and running at a speed of 225 r.p.m. If the lathe is to be operated by foot power either a velocipede or stand-up treadle can be furnished.

Vertical Disk Grinding Machine

Gravity feed is employed by Charles H. Besly & Co., 118 North Clinton street, Chicago, Ill., in their new No. 19 53-in. vertical disk grinding machine. This machine is employed for jointing or flatting such work as stove doors, foundry flasks, meter and large gear cases, split shaft bearings, etc., where it is not necessary to grind to any particular dimension or angle. Usually a number of pieces, as many as the size of the disk wheel will accommodate, are ground simultaneously, the work being laid on the wheel and ground by gravity feed. When the work is too light to grind satisfactorily of its own weight extra weights are placed upon the pieces to keep them in contact with the wheel. As soon as one piece is finished it is taken from the wheel and immediately replaced by a rough piece. In this way the wheel is loaded practically to its limit at all times and in joining castings for split shaft bearings as many as 35 have been ground at one time, a laborer being employed to put the work on the wheel and remove it.

An exhaust ring, which is cast hollow and is slotted for exhausting the grinding dust, extends around the outer edge of the disk wheel. The area of this ring varies from nothing to about 5 in. square at the point where the exhauster is connected to give uniform suction around the entire periphery of the wheel. A section of the ring, 26 in. wide, is removable so that free access may be had to the edge of the disk wheel at this point for grinding work which may have bosses or lugs projecting beyond the plane of the ground surface. This feature renders the machine advantageous for use on stove work. A removable guard ring which is cast in sections is provided around the disk wheel and projects about 2 in. above the grinding surface. This ring prevents the work from flying off the wheel while being ground and also aids in exhausting the grindings. To prevent the work from revolving with the grinding wheel wooden bars such as are shown in the accompanying engraving are usually secured to the ring.



Front and Rear Views of the No. 19 53-In. Vertical Spindle Disk Grinding Machine Built by Charles H. Besly & Co., Chicago, Ill.

The disk wheel is of rough steel and is 53 in. in diameter and 1¼ in. thick. It is machined on both sides so that both faces may be set up with circles. In this way when the circle on one face is worn the wheel can be turned over on the opposite circle used. A spare steel disk wheel is usually furnished with the machine as well as a press so that one wheel may be set up while the other is in use on the machine. This enables the grinding machine to be operated continuously and is a great advantage over the old type of machine which had but one wheel, since it does away with several hours of idle time which occurs each time a circle wears out and it is necessary to set the wheel up while in place. These wheels weigh about 800 lb. each and for convenience in handling are drilled and tapped to receive eye bolts for connecting to a crane or hoist hook. The machine and wheel press are usually served by a chain hoist suspended from a trolley.

The bevel gears employed are fully inclosed in a cast-iron gear case and run immersed in oil. The horizontal shaft carries tight and loose pulleys, 12 in. in diameter and of sufficient width to accommodate an 8-in. belt. A countershaft is not necessary, as the machine can be driven directly from a lineshaft or motor located either above or below it. If desired a pulley for driving the exhauster can also be mounted on this shaft as shown. The grinder is 34 in. high and the complete weight, including two disk wheels and press, is approximately 6000 lb.

In tests made on one of these machines it was found that when jointing cast-iron split shaft bearings the work was done six times faster than by former methods where one man operated two milling machines. When facing the narrow ribs on cast-iron boxes, which were so large that only four could be accommodated at a time, the rate of production was 20 times faster than the former profiling process, and when spots on power pump bedplate castings, measuring 33 x 38 in. and weighing 150 lb., were being faced, the machine did the work ten times faster than the planing machine which was formerly employed.

Boom in Ocean Transportation

While American attention has been centered upon railroads and their rates, whether of transportation or of wages, there has suddenly arisen a condition of ocean carriage of international importance. With surpassing crops soon to reach the seaboard, seeking shipping for their distribution, and with general business increasing the output for foreign consumption, there has come a sudden realization of the enormus rise in prices of ocean transportation. This situation threatens business congestion to a far worse degree than a temporary shortage of cars for domestic distribution. Prices of ocean freights are reaching almost prohibitory levels. Shipowners are cancelling offers. Charterers are withdrawing from present prices. And the situation promises to seriously hamper, and, in some cases, to entirely check the coming business boom to which steamship supply is so necessary.

The shipbuilding trade is unable to meet the demand for ships, though the foreign shipyards are crowded to their utmost capacity and the Panama Canal Commission states, from data collected, that American shipyards are now building or have under construction over 250,000 tons of ships, being far more than ever before.

Foundry Exhibits at Buffalo.—Robert F. Douglass, Buffalo, has been appointed traffic manager for the exhibitors who will be represented at the foundrymen's convention at Buffalo September 23 to 27. E. C. Hall will assist Secretary Hoyt of the Foundry & Machine Exhibition Company and William Schulte has been engaged as installation superintendent. Mr. Hall was on the staff having charge of the exhibits at Pittsburgh and Detroit, and Mr. Schulte has been in service in connection with the last three conventions. Correspondence concerning freight intended for the Buffalo exhibition should be addressed to the Foundry & Machine Exhibition Company, Buffalo, attention of Robert F. Douglass, traffic manager.

L. Vogelstein & Co., 42 Broadway, New York, furnish the following figures of the consumption of foreign copper in Germany for the months January to June, 1912: Imports, 107,944 tons, from which are deducted exports of 5072 tons, leaving as the consumption 102,872 tons, which compares with consumption in the same period in 1911 of 86,188 tons. Of the above imports 93,523 tons came from the United States.

The Tuthill Spring Company, maker of vehicle springs, 760 Polk street, Chicago, has bought an additional piece of property having 25 ft. front on Mather street. This gives an outlet of 50 ft. through into that street.

Uniform Nomenclature of Iron and Steel

Committee's Report to International Association for Testing Materials, Sixth Congress, New York, September, 1912

The committee, No. 24, nominated for the solution of this problem is composed as follows: Chairman, Henry M. Howe, New York; vice-chairmen, L. Lévy, Paris, and D. Tschernoff, St. Petersburg; secretary of the committee, Albert Sauveur, Boston. The members are: Van Drunen, Ixelles; O. Busse, Copenhagen; H. Brauns, Dortmund; Verein Deutscher Eisenhüttenleute, Düsseldorf (representative, E. Schrödter); Jernkontoret, Stockholm (representatives, I. A. Brinell, C. Benedicks, J. O. Roos of Hjelmsäter); F. W. Harbord, London; the Iron and Steel Institute (representative, J. E. Stead); L. P. Sidney, London; A. Pourcel, Paris; H. Le Chatelier, Paris; F. Osmond, Paris; Comité des Forges de France (representative Saladin G. Charpy); P. Verole, Milan; Associazione fragli Industriali Metallurgici Milano (representative, Ing. C. Vanzetti); A. Baalsrud, Christiania; A. R. v. Dormus, Vienna; A. Sailler, Vienna; Bureau des forges, St. Petersburg; N. Belelubsky, St. Petersburg; Service du contrôle et de la réception des commandes du Ministère des voies de comm. (representative, O. Klemm), St. Petersburg; Edvi Illés Aladár, Budapest; Lázár Zoltán, Budapest; Misángyi Vilmos, Budapest; W. Campbell, New York; Joseph W. Richards, South Bethlehem, Pa.; the American Society of Mechanical Engineers, New York; the American Iron and Steel Institute (representative, Charles Kirchhoff), New York; the American Institute of Mining Engineers (representative, Charles Kirchhoff), New York, Henry D. Hibbard, Plainfield, N. J.; H. P. A. Tiemann, Pittsburgh, Pa.

I. Introduction

With a few exceptions the definitions offered by your committee to the Sixth Congress have been favorably accepted by the parties interested and we therefore recommend that they be accepted as standard. New definitions in place of those which seem to need amendment, and definitions of a few additional names, are proposed in section II of this report.

Two names "steel" and "malleable cast iron" need radical treatment in the opinion of part of this committee. Though colloquial and trade usage can easily tolerate two distinct and inconsistent meanings for a single name, scientific usage can tolerate them only reluctantly. Hence some of us recommend taking steps to remove the inconsistencies connected with these two names, as set forth in sections III and IV of this report.

A few additions and amendments to the glossary of our last report have been proposed, but these are so few that we do not burden the present report with a new glossary, and instead we propose to include a revised glossary in our next report, which we hope may be our final one.

Statements as to Apparatus of Manufacture Omitted

Several eminent gentlemen identified with the industry have proposed including in the definitions a statement of the apparatus in which the several products are habitually made, for instance specifying that cast iron is made in the iron blast furnace. But any substance which is identical in nature with cast iron should be cast iron in scientific language no matter how it is made, whether by melting in a crucible, by cementation, by a stroke of lightning, or by any other means now unguessed. Such restrictions do not belong in a definition, the purpose of which is to set up metes and bounds, to part the thing defined from the rest of the universe. But in order to meet their wishes, we supplement the definitions proper with remarks, clearly not defining but cautionary in their nature, which explain how certain of these products are habitually made. Such an explanation may well be useful as an added safeguard against fraud, because an industrial contract presupposes that its own language is to be read in the light of existing industrial conditions and usage. That may be "cast iron" scientifically speaking which is clearly not "cast iron" industrially speaking, as a blind or moribund horse, though still a horse scientifically speaking, is clearly not a horse for most industrial and administrative purposes.

II. New Definitions Proposed

Cast Iron: Iron containing so much carbon that it is not usefully malleable at any temperature. In America, besides the foregoing generic meaning, "cast iron" is used also in a specific sense which excludes "pig iron" (see below) and is restricted to cast iron in the form of castings other than pigs and to remelted cast iron suitable for such castings.

REMARKS. The cast iron of commerce is reduced from the ore, usually in the iron blast furnace, in direct contact with solid carbon, and is then tapped from the furnace in a molten state. It always contains an important percentage of carbon, usually from 2.5 to 4.5 per cent., and in most cases an important percentage of silicon.

There are three chief varieties of cast iron:

Gray cast iron: Relatively soft, and characterized by the presence of sheetlets of graphite, often forming an irregular skeleton. This is the variety used chiefly for engineering work.

White cast iron: Extremely hard and brittle, characterized by having all or nearly all its carbon in the combined state, and by its consequent lack of graphite.

Mottled cast iron: Intermediate between gray and white cast iron.

Pig Iron: Cast iron which has been cast into pigs direct from the blast furnace or its equivalent. This name is also applied loosely to molten cast iron which is about to be so cast into pigs, or is in a condition in which it could readily be cast into pigs.

Mixer Metal: Molten cast iron which has been passed into or through a metal mixer.

Iron Castings: Castings of cast iron.

REMARKS. They are usually made from liquid iron direct from the blast furnace, or by remelting cast iron in a cupola or other furnace, or in crucibles.

Malleable Cast Iron: Iron which is first cast as cast iron and later made malleable without remelting.

REMARKS. Commercial malleable cast iron is first cast as brittle white cast iron, and is then made more or less malleable either by converting most of its carbon from the state of cementite into that of temper graphite, or by removing most of it by oxidation, or by both means jointly. In both cases the malleablizing is done by close annealing, usually in contact with an oxidizing agent. Thus there are two classes of commercial malleable cast iron, of which one owes its malleability to a large removal of carbon, and the other to a large removal of carbon from the outer part of the casting, and to the precipitation of much of the remaining carbon in the free or graphitic state. It is not in accordance with good industrial usage to apply the name "steel" to any products of these malleablizing processes, or to any product made by remelting cast iron in a cupola or like furnace, and such application is generally held to be fraudulent.

Malleable cast iron differs from steel, (1) usually in containing more carbon, and (2) in being cast into a mass which is not initially malleable. Malleable cast iron is not strictly cast iron, but a distinct species, co-ordinate with wrought iron, steel, and cast iron.

Wrought Iron: Malleable iron which is aggregated from pasty particles without subsequent fusion, and contains so little carbon that it does not harden usefully when cooled rapidly.

REMARKS. Commercial wrought iron, though occasionally made directly from the ore, is usually made from cast iron by such removal of its carbon and silicon as to convert it, at the high temperature used, into pasty particles, and by squeezing these together in a bath of cinder or slag into a coherent mass which retains permanently an important quantity of that slag.

In Great Britain "malleable iron" is often used as synonymous with "wrought iron," but sometimes at the risk of leaving the lay reader in doubt whether it refers to wrought iron or to malleable cast iron. Hence we advise against this use of "malleable iron."

Steel: See "carbon steel" and "alloy steel" below.

I. Fluid origin. Iron which is cast from the molten state into a mass which is usefully malleable initially at least in some one range of temperature.

REMARKS. Such metal is steel whether it can be hardened or not, whether it contains much or little or even no carbon, and for that matter even if it is chemically pure iron. It is sometimes called "ingot metal." With the exception of "blister steel" and its derivatives all the steels which have any present industrial importance including the "alloy steels" (see below) fall under this definition.

These steels have been divided into:

(a) Ingot iron: Steel with too little carbon to harden usefully on rapid cooling. This name has never been widely used, and for a long time fell into complete disuse. It has lately been revived as a trade name. It should be avoided in scientific and technical writings because, with the iron-carbon alloys divided into the four great species, (1) wrought iron, (2) steel, (3), cast iron, and (4) malleable cast iron, it is confusing to call a variety of "steel" "ingot iron."

(b) Ingot steel: Steel with enough carbon (say 0.30 per cent. or more) to harden usefully on rapid cooling.

Steel made by melting in a crucible is called "crucible steel"; that made in an electric furnace is called "electric steel."

II. Plastic origin: Iron which is aggregated from pasty particles without subsequent fusion; is malleable at least in some one range of temperature; and contains enough carbon (say 0.30 per cent. or more) to harden usefully on rapid cooling from above its critical range.

REMARKS. Blister steel and its derivatives and a few other high-carbon steels which are unimportant today are the only present steels covered by this definition.

Blister Steel: Steel of plastic origin made by cementing wrought iron with carbonaceous matter. Also, commerically, such steel when heated and worked into merchant sizes. Most writers have used "blister steel" in the former and broader sense. In Sheffield it is used solely in the latter and narrower sense.

REMARKS. The blister steel of commerce is made by cementing very pure wrought iron with charcoal.

Blister Bar, Cement Bar, Converted Bar: Bars of blister steel.

Plated Bar: Bars of blister steel which have been rolled or hammered while hot.

REMARKS. This treatment, which is usually applied to such bars broken to convenient lengths, flattens down their blisters and toughens the metal somewhat.

Single-Shear Steel: Shear steel made by welding a pile of plated bars into a faggot. Also the bars and other merchant shapes made by rolling or hammering such a faggot.

Double-Shear Steel: Shear steel made by piling, hammering, and thus welding bars of single-shear steel into a bloom. Also the bars and other merchant shapes made by rolling or hammering such a bloom.

Carbon Steel: Steel which owes its distinctive properties chiefly to the carbon as distinguished from the other elements which it contains.

REMARKS. Though among the alloy steels some are but moderately malleable, among the carbon steels industrial usage confines the name "steel" to products malleable enough to be rolled or forged into merchant shapes.

Alloy Steel: Steel which owes its distinctive properties chiefly to some element or elements other than carbon, or jointly to such other element and carbon.

REMARKS. Some of the alloy steels necessarily contain an important percentage of carbon, even as much as 1.25 per cent. There is no agreement as to where the line between the alloy steels and the carbon steels shall be drawn.

Ferroalloys: Iron so rich in some element or elements other than carbon that it is used primarily as a vehicle for introducing that element in the manufacture of iron or steel.

REMARKS. The ferroalloys are not usually usefully malleable, and they usually contain more of the alloying element than is desirable in an alloy steel. With variations in industrial conditions the line between alloy steels and ferroalloys must needs shift. Indeed, a substance might simultaneously be an alloy steel in the machine shop and a ferroalloy in the steel mill.

Semi-Steel: A vague trade name for various products near the border line between steel and cast iron. Among these are low carbon cast iron made in the air furnace, or in the cupola furnace by the addition of steel scrap to the charge. Also a trade name for malleable cast iron.

III. Steel and Malleable Cast Iron

Your committee is divided concerning two anomalies in present nomenclature, (1) that what is called "malleable cast iron" lacks the essential and defining property of other cast iron, lack of useful malleableness at all temperatures, and (2) that what is called "blister steel" lacks the essential and defining property of other steel, its being cast from a molten state into a mass initially malleable. A part of your committee proposes but the minority opposes taking the initial steps to rid first scientific, then technical, and finally industrial nomenclature of these anomalies, by removing malleable cast iron from the class "cast iron" and blister steel from the class "steel," and giving these species new distinctive specific names. The initial step proposed is formulation in section IV of this report of propositions touching this subject, with the purpose of bringing out the arguments for and against this plan. If after thorough discussion either or both these amendments of the classification should still seem wise, your committee would propose to offer to the Seventh or 1915 Congress the necessary resolutions and definitions for putting these amendments into effect. Though this matter has been under discussion in a general way for nearly 40 years, yet in deference to the wishes of the British members we do not ask any formal expression of opinion from the Sixth Congress.

All agree that these anomalies exist; that the only one important quality which the various varieties of cast iron apart from malleable cast iron have in common, and therefore their one defining characteristic, capable of serving to distinguish them from other kinds of iron, is that they are not usefully malleable at any temperature, whereas malleable cast iron is very malleable; and that the only one important quality which the various varieties of steel other than blister steel have in common, and therefore their one defining element, is their having been cast into a mass initially malleable whereas blister steel is not so cast. All agree that if malleable cast iron and blister steel were removed from their present classes of cast iron and steel, and given distinctive names, our nomenclature would be simplified and made more consistent, and that this greater simplicity and consistency would, taken in and by themselves, be good. But as to the expediency of taking the first steps in this direction we differ.

Were these steps once taken, the nomenclature might be given greater precision by defining "useful malleableness" quantitatively; but this further refinement might well follow the initial step of moving distinctly in the direction of qualitative consistency.

A Parallel Drawn from the Fish Industry

A glance at the roughly parallel case of the science of ichthyology and the fish industry may clarify the matter. They have the same ultimate purpose, to benefit man; but their means differ radically. Ichthyology must needs proceed scientifically, *i. e.* systematically and with precision. Its usefulness demands these conditions. Precise and consistent terminology forms a needed part of this system and precision. Consistency compels ichthyology to exclude mammals from the class "fish," and hence it excludes whales. But the fish industry stands in a radically different position. It has no need of consistency of nomenclature, based on specific characters. Hence it speaks of whales as "fish." It refuses to respect the nomenclature of ichthyology, though properly accepting everything of industrial value which that science lays bare.

But of the two, it is the ichthyologist rather than the fish industrial that gains the ear of the rest of educated mankind through his lectures and writings. As with the secular progress of education an increasing proportion of the educated take their language from the ichthyologist, more and more adopt the scientific nomenclature which excludes whales from the class fish, first because it is the nomenclature of those who have their ear, second because they like its consistency. They come to regard as ignorant and ill educated those who think of the whale as a fish. With the further progress of the world, an increasing proportion of the captains of the industry receive an education high enough to familiarize them with the scientific nomenclature, and adopt it because of the human wish to be ranked with the educated. From like human motives the fashion thus set works down to ever lower levels. So in time by the working of natural processes the consistent nomenclature slowly displaces the inconsistent, and the revolution is complete. This is one of the mills of the gods which, though it grinds slowly, and sometimes seems to stop grinding, yet in the end surely grinds exceedingly small.

Metallurgy and the Metallurgical Industry

Applying these considerations to our present case, there is the metallurgical industry, and there is the science of metallurgy. Till lately the industry has dominated the science completely. The science has been little more than the direct handmaid of the industry, serving mankind only indirectly and through the industry. But the time will come and may have come already, when the science must do its own independent work in its own way, as the sciences of botany, ichthyology, geology, and mineralogy do theirs. In one case as in the others the intellectual work of the science confers its ultimate material benefit on mankind through the administrative work of

the industry which it directs—botany through the farming and the lumber trade, ichthyology through the fish trade, geology and mineralogy through the mining and metallurgical industries; but in one case as in the others the time comes when the science refuses to sacrifice its efficiency and its power of expressing itself to mankind apart from the industry which it serves, by submitting to inconsistencies of nomenclature which are irksome and hampering to it, however easily tolerated by the industry. In each case the degree to which the science does its intellectual and experimental work apart from the industry, and addresses itself primarily to itself and to the public and only secondarily to the industry, increases progressively and irresistibly. The science comes to demand more and more insistently that it shall be freed from inconsistencies of nomenclature. It points out that though these inconsistencies are more hampering to its work which is primarily intellectual than to the work of the industry which is primarily administrative, yet the simplifications on which it insists for its own sake will in the end be a convenience to the industry itself.

In 1876 metallurgical science made a struggle against existing inconsistencies of nomenclature, but it was too weak to succeed. The industry will always be inconvenienced temporarily by any change, however useful it may be in the end, and, naturally mindful of that present inconvenience rather than of the convenience to posterity of inheriting a consistent and convenient nomenclature, monetary system, or system of weights and measures, is likely always to oppose every such improvement, however useful. Hence the survival of pounds, shillings, and pence, and the postponement of the universal adoption of the metric system.

The Time Has Come to Make the Nomenclature Consistent

Without proposing the impossible task of making trade nomenclature consistent, we may now ask, "Has metallurgical science grown enough stronger in these thirty-six years to enforce its demand for consistency of nomenclature for its own use, in addressing itself and the rest of mankind apart from the industry?" We believe that all other branches of science of which there are industrial applications have such a nomenclature. Has the time come when we are strong enough to erect and maintain one, or must we wait yet awhile? That we shall be strong enough one day cannot be questioned. Are we today? A part of your committee believe that we are, and that we should now take the initial step already indicated.

As every body of men in enforcing their rights must respect the rights of others, so must the men of science, as the weaker party, scrupulously respect the rights of the industry. The industry naturally refuses to adopt the changes which we propose for the sake of consistency and clearness. This refusal is within its rights. It has a right to retain the existing inconsistencies. This right we must respect. Beyond this, we must do nothing likely to facilitate fraud.

In order to carry out this programme we give in this present report the present names and the corresponding definitions, for present use; but we formulate propositions reciting the facts, and recognizing that the interests of science and of the public require that these inconsistencies be removed by removing the steels of plastic origin from the class "steel" and malleable cast iron from the class "cast iron." These propositions are not offered for adoption. They aim to focus the matter and bring out the arguments for and against our plan.

If reason appears to be on our side, we expect to recommend to the Seventh Congress that it advise that the resultant consistent nomenclature be used in scientific and technical writings, but to record industrial usage.

If this course is followed, a strictly consistent nomenclature and definitions will be available for scientific purposes, and yet the trade usage will not be affected except gradually as it adopts the usage of science.

We believe that such consistent nomenclature, if authorized by a body of such weight as the Seventh Congress, will be welcomed by scientific writers and teachers, because of its consistency. Taught by them through their writings and addresses to their hearers, readers, and the public, it will be adopted gradually by technical writers because of its consistency. Because it is the fittest it will survive, and in the fullness of time will drive out the inconsistent nomenclature.

At Present Shifting According to the Needs of the Hour

We cannot shut our eyes to the fact that the coexistence of the two different meanings of steel, based on radically different definitive properties, the "hardening power" for "steels" of plastic origin, and "fluid origin" for other steels, not only makes our nomenclature inconsistent, but causes it to shift from one inconsistency to another according to the needs of the hour. This situation offers a strong temptation to play upon these two meanings in such a way as to set a given product in the then best selling class. There are many varieties which, by this play upon meanings, may be shifted from "steel" to "iron" and back, according to which of these names is at the moment the more attractive to the public. For instance, prior to Bessemer the hardening power was the essential defining property of "steel"; but those interested in the Bessemer process disregarded existing nomenclature, set up the fluid origin as the defining property, and called all Bessemer products "steel" whether they would harden or not, "steel" being then associated in the public mind with superiority. Today the tables are turned; "iron" is associated in the public mind with superiority, and commands a higher price than "steel" of like composition. Just as in Bessemer's days certain makers sought how to include their product in the class "steel," so today certain others seek, perhaps unconsciously, how to exclude theirs from that class.

Those who make a special low carbon open-hearth steel exclude it from the class "steel" by adopting the hardening power as the definitive property; whereas makers of puddled steel exclude their product from the class "steel" by adopting fluid origin as the definitive property. Both may be acting in perfect good faith. In some cases they evidently are. It is not they but the coexistence of contradictory meanings that is to blame.

As the trade refuses to be bound by its own inconsistencies, but shifts thus from one to another, playing upon the confusion which it has itself created, it is well that science should step in, select the dominant usage, and say "I will adopt this usage, and my character is warrant for its fixity; you may shift from one usage to another as you will, but with Homer's helmsman I will keep my rudder true, and because my usage is consistent and fixed you will eventually recognize it as the standard."

The Question of Fraud

Turning now to the question of fraud, we have never heard that the fact that the definition of "fish," adopted by the educated world apart from the fish trade, excludes whales has ever worked anybody a hardship, unless it is a hardship to whalers to be excluded from the caste of "fishermen"; nor can we conceive probable contingencies under which that exclusion could facilitate fraud. In the same way we fail to conceive probable contingencies under which the proposed exclusion of blister steel from the class "steel" in a strictly scientific nomenclature can facilitate fraud. If those who fear such fraud will really face the matter, and ask themselves how it can come about that fraud should result from giving a scientific definition of steel, "iron cast from the molten state into an initially malleable mass," coupled with the explanation of the industrial uses of the word "steel," we believe that they will find that this fear is not only utterly vague but groundless, a nebulous creation of their own imagination. If in any way it should suggest to the buyer of blister steel not to pay an irresponsible and unknown seller before having some reason to believe that his purchase corresponds to his needs, that does not seem to us a hardship which should forbid our making our nomenclature consistent.

To couple a statement of existing industrial usage with the strict scientific definition would prevent the use of the scientific definition for customs frauds and other legal frauds, because where scientific and industrial usage differ, the customs laws and judicial interpretations in general are necessarily based on the accepted industrial meanings. Contracts, expressed or implied, are necessarily interpreted as being based on the meaning presumably attached by the contracting parties to their own words,

and these parties, in entering into their contract, clearly must have industrial rather than scientific considerations in mind.

But beyond this, the complete prevention of fraud is not a proper function of a definition. The definition of "horse" properly includes blind, lame, and moribund horses; that of "fish" properly includes decayed fish. A lexicographer who framed his definitions in general so that they excluded from the various classes all individuals save those most useful industrially would be as mad as the purchaser of a horse who paid for it without some reason, from inspection, from the known character of the seller, or from other sources, to believe that it was neither blind, lame nor moribund, unless blindness, lameness, and death happened to be harmless for his special purpose. Equally insane, in our opinion, would be the purchaser who paid for a given lot of steel without some reason to believe that it was of the kind which he needed, be that reason a contract expressed or implied as to its composition or properties, be it the known character of the seller, be it the brand of the steel, or be it what you please. Your committee does not understand that one of its duties is to protect the reckless from the consequences of their recklessness.

Attacking the Fear of Causing Confusion

The fear that our proposition would cause confusion seems to us to rest equally on misapprehension. To fix our ideas, let us suppose for the moment that the name selected for "blister steel" were "blister metal" and that the name selected for "malleable cast iron" were "malleablized cast iron," and let us further assume that the names actually selected shall be fit, shall suggest clearly the colloquial name to which they correspond, and shall not be likely to be confused with other existing names, whether precise or colloquial. The effect of our proposition would not be to remove the words "blister steel" and "malleable cast iron" from industrial use; to attempt that would be like trying to stop the east wind. It would simply degrade them from their present position of being part of scientific nomenclature to being current colloquialisms. The technically educated man would know that the strict scientific name "blister metal" corresponds to the colloquial name "blister steel," and the scientific name "malleablized cast iron" to the colloquial name "malleable cast iron." He might indeed continue to use the colloquial name except where precision was called for. The mere fact that a name is colloquial and not part of scientific nomenclature is no bar to its use. The speech and the informal letters of most of us abound in colloquialisms, if not in slang. Is the fish trade hampered or confused by the fact that ichthyologists call whales "mammals"? And would the steel industry be confused by our using the name "blister metal" or "malleablized cast iron" in technical writings? For a very large number of our common words strict and colloquial meanings exist side by side, and for many of our common objects accurate and colloquial names exist side by side, without causing confusion

Experience proves that when, for purposes of a consistent scientific nomenclature, a substance is removed from the class in which it has stood till then and set in another class, no harm is done to the industry which makes or deals in that substance. Whales were removed from the class "fish" to the class "mammal"; oil of vitriol from the class "oil" to the class "acid"; carbonic and phosphoric acids from the class "acid" to the class "anhydride"; oil of wintergreen from the class "ether" to the class "ester"; black lead from the class "lead" and given a new name "graphite." In the previously existing and wider meaning of their several class names, sulphuric acid was distinctly an "oil," carbonic and phosphoric acids distinctly "acids," oil of wintergreen distinctly an "ether," and black lead distinctly "lead," but for consistency of classification, these classes were narrowed so that each became a consistent unit, by excluding the several alien substances, which were thereby transferred to new classes. These transfers caused absolutely no harm to the several industries, indeed in some cases had no effect whatsoever on the industry and were even unknown to the majority of the industrials. To this day these several substances are called in the industry by their old names to a greater or less extent.

Graphite Presents an Instructive Case

The case of graphite is particularly instructive. Formerly confused with galena, as is shown by their both being called "plumbago" then, its true nature was not discovered till 1779 and its name "graphite" was not proposed till 1789. The name "lead" then and now colloquially and industrially included not only metallic lead, but also black, white and red lead. Indeed for the graphite crayons of our pencils there is no familiar name except "lead," and these pencils themselves are universally called "lead pencils." Before 1789 metallic lead and graphite probably were not thought identical, but both were "lead," *i. e.*, "lead" was a generic name. If there was any difference in the closeness with which this name was identified with these two substances, then for all we know it may have been identified more closely with graphite than with metallic lead. Exactly so, nobody thinks that blister steel is identical with steel of fluid origin, and the name "steel" has been used longer for steels of plastic than for those of fluid origin. But in the one case as in the other the need of precision and consistency in scientific nomenclature leads us to narrow the scientific meaning, that of "lead" to metallic lead, that of "steel" to fluid origin steels, for the simple reason that no other mode of narrowing it to a consistent unit offers. No reason suggests itself why the removal of blister steel and malleable cast iron from the classes in which they do not belong should do harm or cause confusion, seeing that the parallel removal of graphite from the class "lead" was harmless.

Let those who fear confusion from the co-existence of standard scientific and colloquial words and meanings ask themselves frankly whether those who habitually use colloquial words and meanings are in fact confused when careful writers write of "tin plate" instead of "tin."

Let them ask what trade was hampered or confused when whales were transferred from the class "fish" to the class "mammal," or is hampered by the fact that trade still calls them "fish" and science "mammals"; or what trade is confused or hampered by removing black lead from the class "lead" and re-naming it "graphite," or by the present co-existence of the names "black lead" and "graphite," or by the co-existence of the colloquial meaning of "lead" which includes "graphite" and the scientific meaning which excludes it? The fear is simply the fear of the unknown, the unrealized, the unimagined; the fear of every change as change, because of failure to imagine correctly the conditions which the change will actually create.

An Apparent Discrepancy Explained

Some unfamiliar with the conditions have thought that there is an inconsistency between the attitude expressed concerning "cast iron" in the fourth paragraph of this report and the proposition to remove blister steel from the class "steel." But the slightest examination shows that no such discrepancy exists, as we will now explain.

That wrought iron and low-carbon steel must for the present continue to be distinguished by means of their origin, the plastic origin of wrought iron and the fluid origin of such steel, nobody questions. The importance of distinguishing between these two classes is self-evident. We all recognize the influence of the presence, quality and distribution of the slag of wrought iron, its facilitating welding, its increasing the plasticity under certain important conditions, its lowering the transverse ductility, etc., etc. But when we try to frame words which shall express this difference by means of positive inherent properties as distinguished from origin we fail. He who shall frame such words will thereby open the way to a great improvement on our classification and definitions. We cannot distinguish wrought iron from such steel by its greater slag-content, for some such steel contains more slag than some such wrought iron, and so on with each of the points of difference. Collectively their importance is neither questionable nor questioned, but nobody has yet found a way of framing words which shall distinguish these two classes from each other in terms of these unquestionably important inherent properties. Therefore, awaiting the coming of the framer of such words, we must needs be content to base the distinction between wrought iron and such steel on origin, a poor way philosophically speaking, but yet a perfectly effective and good working substitute for a better, and therefore to be retained till that better appears.

This being the case, the proposal to remove blister steel from the class "steel" is not a proposal to set up origin as a new basis of classification but to extend its use to the strictly analogous purpose of parting high carbon steel of fluid origin from blister steel which is of plastic origin, and thus making our classification consistent by using the same basis for low and for high carbon products.

Some say "Why should not identical properties in the case of blister steel and crucible steel of like composition cause them to be classed together?" This is a mere befogging of the issue. We deny most emphatically such identity of properties. It may be true that for certain specific purposes such blister and such crucible steel may be equally well fitted, but that is neither here nor there. For certain specific purposes low carbon steel and wrought iron may be equally well fitted; horses and oxen may be interchangeable for plowing, nevertheless they deserve distinctive names.

Low Carbon Steel and Wrought Iron

If it were practicable to erase the present "origin" basis of distinction between low carbon steel and wrought iron and to use the hardening power as the basic quality of steel, we should concede the utility of discussing the relative appropriateness of the two bases, according great weight to the priority of the hardening power as a basis. But because, as all admit, the origin basis must needs be retained for parting the low carbon products, and because origin is therefore the only single element available, we maintain that the use of "origin" should be extended from the low to the high carbon products, more specially because this extension of this "origin" basis to the high carbon products would cause a minimum of shifting puddled steel, which was formerly grouped with blister steel, has spontaneously ceased to be called puddled steel, at least in America. There remain only blister steel and its immediate derivatives, an altogether insignificant and moribund class, not made in America nor we believe to any important extent in any country except England. Moreover, this class of products interests only a very small class of men, who would not pay the slightest heed to the narrowing of the class "steel" in a strictly scientific classification so as to exclude blister steel, but would go right on calling it blister steel, and would be no more affected than the black lead industry is by the scientific exclusion of black lead from the class "lead."

Returning now to the case of cast iron, its basic property is its unalterable brittleness, and not its origin. That of low carbon steel is necessarily and regrettably its origin. The fact that consistency can be had only by extending this basis of "origin" to the high carbon products, fluid origin steel and blister steel, furnishes no excuse for introducing origin into the definition of cast iron. Further, that to which we object is not the use of origin as a basis of cast iron, but restricting cast iron to the product of a special kind of furnace, a restriction which has nothing in common with the use of origin as the basic element in steel. We are forced to part wrought iron from low-carbon steel, not by specifying the kind of furnace in which it must be made, but by fluid vs. plastic origin. Were the proposition to restrict cast iron also to material of fluid origin, it might be debatable. But the proposition to restrict cast iron to the product of a single kind of furnace appears to us indefensible.

Is it not true that, with the sole exception of metallurgy, every branch of science which is related to an industry has its own nomenclature, which coexists with the industrial nomenclature without harm to either? Are the farmers, florists, and lumbermen harassed because the botanist uses his more precise Latin names? Do they not purposely adopt those more precise names when they wish to be exact? Are the dealers in horses, fish, sheep, cattle, bird plumes, and the like plagued because the zoologist uses his more precise Latin names? Do they not often turn to those names when they need special exactness? Some think that when we metallurgists who are specially interested in the science as distinguished from the art of metallurgy propose to make our own nomenclature consistent we are doing some unheard-of thing. But is it not the truth that in our supineness we have deferred to this astonishingly late date the enforcement of that right which every other branch of science long ago enforced, and enforced without any harm to the allied industry, the right to a consistent nomenclature? We believe not that consistency and precision of language tend to confuse, but that to defer making language systematic and consistent is to prolong confusion.

The foregoing part of section III represents the views of part of the committee; the views of the British members are as follows:

Views of the British Members of the Committee

The British members of Committee 24 regretfully find themselves compelled to dissent from some of the most important views expressed in section III of this report prepared and therefore are obliged to state their own views. After consultation with a special committee of British manufacturers appointed to confer with them, they have drafted a few alternative definitions which they herewith beg to submit for consideration.

The chief points of difference in the definitions are in respect of (1) steel, (2) wrought iron, and (3) malleable cast iron. With the exception of these, they have, with a few modifications, adopted almost in their entirety the proposed official definitions and the remarks thereon.

The British members understood that the committee was appointed not to introduce new names in the places of old ones, but to define clearly existing terms as they are understood by technical men. They take the strongest exception to the recommendation to remove steel of plastic origin from the class of steels, and to give these and malleable cast iron new names. The steels in question possess the well-known property of hardening and tempering, which, until a few years ago, was regarded as the essential and distinctive property of steel. If these recommendations should be accepted, large quantities of cutlery steel, shear steel, and other materials which have for generations been known as steel will have to be excluded, and they consider that any attempt to rename such well-known materials would be impracticable, lead to confusion and greatly discredit the work of your committee and that of the association. They therefore consider it is not only undesirable but worse than useless to attempt to introduce new names for well-known products, such as cemented steel bar, shear steel, malleable cast iron, etc. With regard to the term "malleable cast iron," it may be admitted that this is not in itself an ideal one, but it has become incorporated in technical literature and by common usage is now so well understood by technical men that the British members cannot see how any useful purpose would be served by altering the name; provided it is carefully defined, less confusion would, in their opinion, arise by retaining the existing term than by any attempt to introduce a new one. In England, and, so far as they are aware, on the Continent, "malleable cast iron" has never been classed with cast iron, but has stood by itself, and there has never been any confusion between it and "cast iron" among technical men.

In view of the great difficulties of carrying on a discussion by correspondence with members of the committee in all parts of the world, and in many cases speaking different languages, the British members are of the opinion that the detailed discussion and full consideration of the various views expressed have not been possible to the extent necessary to enable the members of your committee to exercise that considered judgment, which is so essential to enable them to arrive at a decision on questions of such far-reaching importance. They therefore most strongly support the official recommendations that the questions raised in section III be fully discussed, but that the Congress should refrain from committing itself to any official expression of opinion thereon and defer action until the views and criticisms of the whole of the members of the committee have been further elicited.

British Definitions

Cast Iron: Iron containing varying percentages of silicon, phosphorus, etc., and so much carbon that it is not usefully malleable at any temperature.

REMARKS. The cast iron of commerce is reduced from the ore, usually in the blast furnace, in direct contact with solid carbon, and is then tapped from the furnace in a molten state. It always contains a considerable percentage of carbon, usually from about 3 to 4.5 per cent., and in most cases an appreciable percentage of silicon.

Varieties of Cast Iron: In agreement with official report.

Pig Iron: Strictly speaking, cast iron which has been cast direct from the blast or other furnace into molds of varying sizes and shapes, known as pig molds, and allowed to solidify in the form of pigs or slabs.

REMARKS. This name is also applied loosely to molten cast iron which is about to be so cast into pigs or is in a condition in which it could readily be cast into pigs.

Mixer Metal: In agreement with official report.

Iron Castings: Castings made by pouring molten cast iron into molds of designed shape or form, other than in the form of pigs or slabs.

Malleable Cast Iron: Iron which is first cast into molds and afterward made more or less malleable without remelting, by close annealing usually in contact with an oxidizing agent.

REMARKS. Commercial malleable cast iron is first cast as brittle white cast iron and is then made more or less malleable either by converting most of its carbon from the state of cementite into that of temper graphite, or by removing some of it by oxidation. In both cases the malleablizing is done by close annealing usually in contact with an oxidizing agent. Thus there are two classes of commercial "malleable cast iron," of which one owes its malleability to a large removal of carbon and the other to a large removal of external carbon and to the precipitation of much of the remaining carbon in the free or graphitic state. "Malleable cast iron" differs from steel (1) usually in containing more carbon, and (2) in being cast into a mass which is not initially malleable. Malleable cast iron is not cast iron, but a product of cast iron; it is cast iron which has been made malleable by special treatment and is as distinct from cast iron as wrought iron or steel which are also products of cast iron.

Wrought Iron: Iron which is produced at a temperature below its own melting point either direct, from iron ore, or from cast iron as a malleable mass by the aggregation of pasty particles without subsequent fusion. It contains so little carbon that it does not usefully harden when rapidly cooled, is soft and readily malleable within wide limits of temperature and always contains intermingled slag.

In agreement with official report on "remarks" under this head.

Steel: Iron either pure or associated with other elements which has been cast from a molten state whether it hardens or not on rapid cooling from above its critical range and after solidification is so usefully malleable that it can be forged or rolled into merchant sections or shapes at least within some range of temperature; or, iron which has not been cast from a molten state and contains sufficient carbon to cause it to harden usefully when rapidly cooled from above its critical range and is so usefully malleable that it can be forged or rolled into merchant sections or shapes at least within some range of temperature.

The British members of the committee prefer the definition in the above form, but as the committee of steelmakers suggested its division into two parts they submit it, thus divided, below, for consideration.

I. Fluid Origin: Iron, either pure or associated with other elements, which has been cast from a molten state whether it hardens or not on rapid cooling, from above its critical range and after solidification is so usefully malleable that it can be forged or rolled into merchant sections or shapes at least within some range of temperature.

REMARKS. Such metal is steel whether it can be hardened or not, whether it contains much or little or even no carbon, and for that matter if it is chemically pure iron. It is sometimes called "ingot metal." With the exception of cemented bar, blister steel, and shear steel, and a few similar steels, all steels which have any present industrial importance fall under this definition.

In agreement with official report on paragraphs (a) and (b) under this head.

II. Plastic Origin: Iron which has not been cast from a molten state and contains sufficient carbon to cause it to harden usefully when rapidly cooled from above its critical range, and is so usefully malleable that it can be forged or rolled into merchant sections or shapes at least within some range of temperature.

REMARKS. Cemented bar, blister steel, shear steel, and a few other high-carbon steels are the only commercial steels covered by this definition.

Blister Bar, Cement Bar, Converted Bar. High class Swedish or other wrought iron bar of equal purity which has been subjected to a process of cementation in contact with charcoal, which process, while introducing carbon into the iron, also develops blisters on the surface of the cemented bar.

Blister Steel: A term sometimes used to describe cemented, converted or blister bar which has been heated and worked into merchant sizes.

Plated Bar: Blister bar or cemented bar which has been broken into suitable lengths, heated and hammered out to confer some toughness and to flatten down the blisters.

Shear Steel: Steel made by piling and welding plated bars under a thin layer of suitable flux. The welded bars are drawn down under the hammer into a faggot which is forged into merchant sizes, and is known as "single" shear steel.

Double-Shear Steel: If the single shear steel faggot be nicked, bent back upon itself, the two parts heated, welded and again hammered down, the resulting bloom is known as "double" shear steel. The merchant sizes forged from these blooms are also known as shear steel.

In agreement with official report on alloy steel and ferroalloys.

In agreement with the official report on semi-steel.

The report of the committee concludes as follows:

IV. Propositions to Be Discussed but Not Voted on at the Sixth Congress

I. Whereas every scientific classification should be based on characteristics fit for this purpose so that all the members of each class shall have in common the defining characteristics the possession of which constitutes that class;

II. And whereas, the present classification of the products of iron and steel, however well fitted for the present industrial needs, offends this law in regard to the classes "steel" and "cast iron," first in that blister steel lacks the essential defining characteristics of all other steels, "having been cast from the molten state into an initially malleable mass" which all other steels have, and in virtue of which these other steels are grouped into the class "steel"; and, second, in that "malleable cast iron" lacks the essential defining characteristics of all other cast irons, namely, that their "malleableness, if any, is below the useful limit at all temperatures," in virtue of which characteristics all other cast irons are grouped into the class "cast iron";

III. And whereas these inconsistencies hamper scientific writers and speakers seriously, and tend to confuse their readers among all educated classes, save and except only those familiar with the industry itself, and thereby to obstruct the diffusion of knowledge concerning iron and steel outside the industry;

IV. And whereas the interests of the body of scientific investigators, teachers, writers, their readers, and the public outside the industry have become so important in the premises as to demand recognition;

V. And whereas, though the systematizing of its classification by any branch of science, especially if it is related to an industry, usually results in degrading certain names, or certain inconsistent and contradictory meanings of such names, from their initial position within good usage into colloquialism; yet experience proves most abundantly that this degradation in fact works no hardship and causes no confusion in the industry, which in its current usage disregards such degradation and is not deterred in the slightest degree from continuing to apply a name by the fact that such application has thus become colloquial and not scientific; so that the benefit which science and the outside public derive from the consistency is not offset by any damage to the industry, which remains a law unto itself in regard to trade names;

VI. And whereas blister steel and the allied steels of plastic origin are of only slight importance except in Great Britain, and some of them have elsewhere spontaneously ceased to be called "steel" even industrially;

Now, therefore, it is believed—

First, that, for the purpose of a strictly scientific nomenclature as distinguished from industrial nomenclature, malleable cast iron ought to be removed from the class "cast iron";

Second, that, though in Great Britain the name "steel" has become so firmly attached to blister steel and the allied substances of plastic origin that it is inexpedient to attempt now to remove them from the class "steel" in industrial, commercial, and colloquial usage, at least in that country, yet such removal is desirable for the purposes of a strictly scientific usage, which should adopt the dominant defining characteristics of "steel," the combination of malleableness with fluid origin, and reject the coexisting but inconsistent defining property, "the hardening power."

Hall furnace of the Republic Iron & Steel Company at Sharon, Pa., which has been idle for a long time, is being put in readiness for early operation. This is a comparatively small furnace and will make about 200 tons of pig iron per day.

Confining a Plant to Its Special Field

Why the Temptation to Branch Into Lines of Manufacture for Which the Works Are Not Well Suited Should Be Combated

BY C. A. TUPPER

The work of the ordinary manufacturing plant may be roughly divided into three classes: 1.—The lines of production for which it has been primarily designed. 2.—Secondary production. 3.—Work for which it is unsuitable. Upon the relative proportions maintained among these the success of the concern is largely dependent. Nor is this the simple matter which it might seem.

"Why not?" one may ask. "What is there difficult or unusual about keeping a plant occupied with work for which it is best suited—at least during normal times?"

How Supplementary Lines Become Established

Well, there are many things. Let us say, for example, that the principal business of a concern is the production of a certain standard line of machinery. It has started, probably, in a small way and has gradually been built up until recognized as an important factor in its field. The buildings, equipment, etc., reflect the nature and growth of the business, being planned and developed along the lines originally laid down. During the early or formative period, when the plant was small, the concern adhered to its particular line; or, if it took any work outside of this, each contract formed the subject of careful consideration. As the plant became larger, however, recurrent periods of business depression or dullness made it necessary to find additional "fillers," and these were not always chosen with discrimination, but constituted whatever happened to be most available at the time. Some of the fillers developed into fixtures of production and thus became secondary lines,—perhaps to the extent of requiring distinct departments and additional facilities for their manufacture.

If these new methods were supplementary to the original line, so that their manufacture and sale dovetailed with the latter, they constituted an element of strength and possibly increased the ratio of profit; but if not, it simply meant that the partners in the enterprise had gone into as many additional branches of the business as there were distinct lines of production, the same as though they had formed new companies and leased to each of these a portion of their plant. The result of such a division of forces depends entirely on conditions and management.

Making Everything Rather than Purchasing Any

The third class of work mentioned, that for which the plant is unsuited, usually originates from a desire not to purchase anything which can be made by the firm itself—or, in other words, to save for it the profit which "the other fellow" presumably makes. This idea, as practically carried out, is one of the most fallacious of any that have arisen in the history of the metal-working industries. Its effect, in the great majority of instances, is to retard progress and often it constitutes a positive element of failure.

There may be conditions, such as distance from a base of supply, heavy weights and transportation charges, delayed deliveries from others, substantial premiums offered by customers, the desire to hold a force of skilled men for whom no other work is available, etc., which will justify a manufacturer in undertaking something for which he is not properly equipped either in plant or experience, but these are all exceptions to the ordinary rule, and on them, in every case, lies the burden of proof.

Parts Interchangeable for a Variety of Machines

For example, there are certain auxiliary parts, like valves, gears, pinions, cams, shafts, wheels, levers, bearings, etc., which are interchangeable for numerous machines and can be turned out in large quantities. Some concerns make a specialty of one or more of these lines and are prepared to offer them to machinery builders at relatively low prices.

The problem which here confronts a manufacturer using such parts on complete machines is two-fold. First: will he require enough of these or similar parts to justify maintaining the equipment necessary to produce them,—assuming, of course, that his existing tools are not suited to the purpose? Second: will the net cost of production be less than the best terms he can obtain from specialists in these lines on a contract basis? If from actual figures it appears that either question should be answered in the negative, business prudence will dictate refraining from such a course.

Besides the more common exceptions noted, there may, of course, be extraordinary conditions requiring the manufacture of parts for which the plant is not adapted. As an instance of this a company manufacturing electrical apparatus found itself shut out from obtaining certain needed parts controlled by a rival. It held patents which would have enabled it to produce acceptable substitutes and had decided to do so, when the management learned that a smaller concern was already specializing in that line and would undertake to supply the parts at much less than they could be produced for in a plant not adapted to this particular class of work. So, even under rare circumstances, a better way out of the difficulty may often be found than to penalize the whole machine by manufacturing a part of it at a loss.

Manufacturing Each Machine Part at a Profit

There are, in the writer's belief, few companies engaged in building machines, which have drawn a clear distinction between the parts of such machines produced at a profit and those on which there is a loss, particularly where the latter are purchaseable in quantities from outside concerns. In the case of castings—and particularly steel castings—the difference has doubtless been quite generally recognized, for the reason that the great majority of concerns hesitate to incur the expense of foundry equipment; but the same distinction is applicable to many other lines and should be worked out on precisely the same basis.

This is not to argue that a machinery builder, for good and sufficient reasons, may not undertake to advantage the manufacture of certain apparatus, every detail of which, with the raw material as a base, is produced in his own plant; but that presupposes the provision of equipment suitable for all such parts and it does not, therefore, fall under the heading of work for which the plant is not adapted. For all such cases, however, it is still the part of wisdom to avoid too much ramification of the work. A manufacturer may justify making certain parts at greater cost than they can be purchased for, on the ground that only in his own plant can the necessary standard of quality be uniformly assured, or that he does not wish to place himself at the mercy of the congested conditions in the shops of those from whom such parts would be purchased, but these are all avoidable difficulties which season contracts, rigid inspection and fair dealing will overcome.

Fallacy of Overextending Manufacturing Lines

The same considerations hold true of what may be termed auxiliary apparatus. Many a machinery-builder has felt that, having a good established trade in the main equipment of certain industrial plants or processes, he might as well go a step farther and manufacture the rest of the line.

For example, most builders of power machinery have felt at one time or another a call to enter upon the making of boilers, feed-water heaters, boiler-feed pumps, etc., but few such attempts have been financially successful. The design of boilers and their application to varying conditions is strictly a business by itself and requires, for really economical units, the highest type of specialization. It is far different with machines such as prime movers and

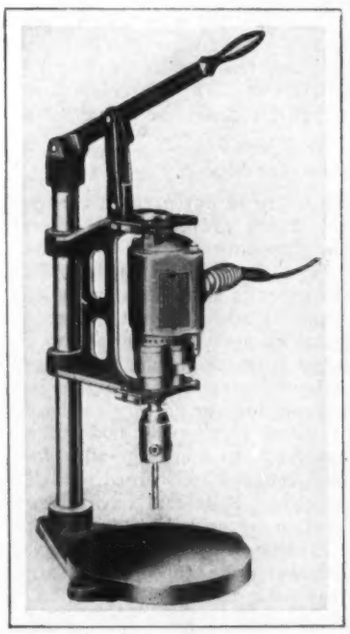
generators coupled on the same shaft, which must operate under identical conditions. Where, however, this close community of interest does not exist, it is better to keep two lines of production separated.

Another thing not to be overlooked, from the commercial standpoint, is the fact that every manufacturer who goes outside his own legitimate line or lines of production has the influence of every concern in the invaded field not only exerted against him there, but thrown in favor of his competitors elsewhere. For example, a power machinery builder, who sets out to sell boilers also, soon discovers that the representatives of the boiler-makers find opportunities in connection with every new contract for a power plant to leave behind them criticisms of his engines or generators, or both, which rankle in the prospective buyer's mind.

Apart from its influence on the prosperity of a particular individual, firm or company, the tendency to "hog" work better done outside is to check by just that much the remarkable development of specialization which has carried American machinery into the strongholds of foreign manufacture and made a large place for it in the markets of the world. That this development has had a most important influence on the metal-working and other industries of the country is not to be denied, and it should be encouraged in every possible way for the future. The farther it is carried, the greater will be the net gain to the productive and marketing capacity of the nation as a whole.

Sensitive Drilling Stand

For use where accurate and rapid drilling is required the Chicago Pneumatic Tool Company, Chicago, Ill., has developed a sensitive drilling stand. This stand is strong and substantially made throughout and is built to take the standard Duntley portable electric drilling machines of either the No. 000 or the No. 00X type, which have capacities of 3/16 and ¼ in. in metal respectively. The drilling machine itself is held in place by two clamping straps which are secured by screws and thumb nuts as shown in the accompanying engraving. If desired the tool can be removed from the stand in a few seconds and used as a portable unit.

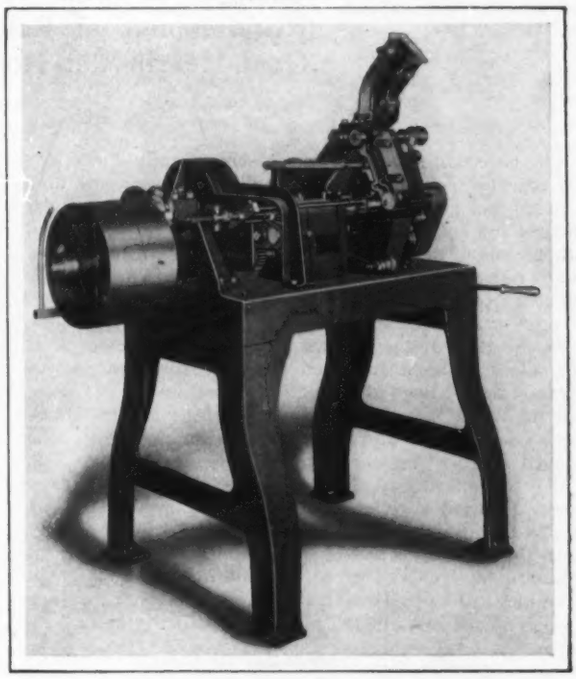


The New Stand for Duntley Electric Drilling Machines Built by the Chicago Pneumatic Tool Company, Chicago, Ill.

The Halcomb Steel Company, Syracuse, N. Y., has opened a sales office at 95 Liberty street, New York City, to give more efficient service to its local customers in this territory. It calls attention to Halcomb special high speed tool steel, Halcomb Ketos oil hardening non-shrinkable steel, Halcomb water hardening tool steel and Halcomb crucible tungsten magnet steel, also the fact that it is the pioneer American maker of electric furnace alloy steels, which it supplies in chrome vanadium, chrome nickel, chrome silicon, silico manganese, nickel and other alloys to meet special requirements of machine tool and automobile parts. All these products are furnished hammered or rolled in form of billets, bars or forgings, and unannealed, annealed or oil tempered. The company is also in a position to cold draw and cold roll from 0.007 to 3 in. diameter and corresponding sizes in squares, flats, special shapes, etc., exact to size. The New York sales office is in charge of F. W. Ross.

Automatic Thread Rolling Machine

For rolling threads on round shells having flanges or steps, the E. W. Bliss Company, 11 Adams street, Brooklyn, N. Y., has designed and built a new type of automatic



A New Type of Automatic Thread Rolling Machine Built by the E. W. Bliss Company, Brooklyn, N. Y.

thread rolling machine. In addition to the work on stepped shells, it is also possible to handle straight cylindrical pieces.

In the accompanying engraving the machine is shown arranged with a feeding chute for harness oil tops. With this equipment it is possible to roll a thread on the neck of a shell where the neck is as small as ½ in. in diameter and as large as 3 in. When cylindrical shells are being operated upon, one feeding chute with two sets of adjustable liners will take care of the entire range of work for which the machine is adapted, although a separate feeding chute is required for each different shape of shell when pieces other than cylinders are being threaded.

In operation the shells are placed in the chute and are released by an automatic trip. The chute is made in two sections and the lower half swivels and carries the shells in line with the lower chuck. An automatic pusher forces the shell on the chuck and the feeding chute recedes, the shell being held in position by a retainer while the upper chuck moves in and rolls the thread. At the completion of the thread rolling operation the finished shell is automatically ejected.

The capacity of the machine is 30,000 shells ranging in diameter from ½ to 3 in. and having a maximum hight of 1¾ in., in 10 hr.

A. M. Castle & Co., Chicago, well known warehousing merchants of iron and steel, have purchased property near Division street, fronting about 350 ft. on the North Branch of the Chicago River, and containing nearly three acres, on which two warehouse buildings, 80 x 260 ft., and a two-story office building, 65 x 100 ft., will be erected. Upon completion it is the intention to remove thither the offices and warehouses now located on North Jefferson street and on Morgan street in the downtown district. Construction is to be started at once upon a dock and shipping yard from which steel can be handled by water or rail. The site is served by the Chicago, Milwaukee & St. Paul Railroad.

The finishing building being erected by the American Rolling Mill Company, Middletown, Ohio, recently mentioned, will be 150 x 187 ft., one story, and will soon be ready for occupancy.

The American Steel Rail Situation*

Changes in Mill Practice and in the Requirements of Railroads—Results from Open Hearth Rails Not Entirely Satisfactory

BY J. P. SNOW†

The objective sought by purchasers of rails during the past score of years is steel that will resist wear and flow of metal and at the same time will possess safety against fracture and sufficient strength of section to carry the load without undue deflection. The wheel load imposed upon rails is now so near the limit of endurance of carbon steel, that it is necessary to seek for the highest attainable character of metal that can be secured on a commercial basis.

At the time of the general adoption of Bessemer steel rails, after wrought iron had proved inadequate, it was everybody's privilege to prescribe a section of his own, with the result that the principal burden of rail mills was to provide and find storage for the accumulation of rolls grooved to turn out the numberless patterns demanded. In 1893 a committee of the American Society of Civil Engineers reported a series of standard sections for various weights of rail, which has been used very largely by many roads since. This series is of the thick-base heavy-head medium-hight Tee rail type; the width of base is equal to the hight of rail. Its adoption brought a large measure of relief to the mills in the matter of changing rolls.

Former Mill Practice and Its Defects

In the decade following 1895, improvements in plants and changes in methods of making rails were made at various mills, which resulted in greatly increasing their output, but which also apparently resulted in decreasing the durability and reliability of the rails. Many roads in the northern section of the country were troubled with split bases resulting in base breaks of the crescent type, and roads using very heavy equipment recorded many failures due to split heads. Square breaks were numerous, also, as well as trouble from flow of metal and lamination of corners. Split bases were traced pretty generally to longitudinal flaws in the surface of the base due to folds in the skin of the bar during the process of rolling, gas holes in the ingot, or breaks in the surface of the bloom caused by heavy reductions in the early passes. Split heads were proved to be due to lack of homogeneity of metal in the heads. This same defect led also to square breaks, as well as to lamination and s[illegible]elly corners.

The metallurgical s[illegible]udies which developed these facts were inaugurated by James E. Howard of Watertown Arsenal, who cut up, polished and etched a very large number of rails, both those which had shown good service and those which had failed. Ingots, blooms, rail bars and finished rails were also cut up and studied, showing the complete history of the steel from the ingot to the rail. Altogether this was the most exhaustive study of the actual physical condition of steel during the rolling process that has ever been recorded[1]. These and subsequent studies by Max H. Wickhorst show that unsoundness in rails, as manifested by light and dark streaks and inclusions of slag and various compounds of metalloids, has its origin in the ingot and ladle.

Recent Improvements in Manufacture

The agitation produced by these studies, and by the unsatisfactory records of rails in service, led to efforts on the part of the rail manufacturers, consumers, experts and others to improve matters, with the result that American rails as rolled to-day are much better than those rolled five or even three years ago. Improved methods of recarburizing and deoxidizing the Bessemer bath, with reasonable allowance of time for the chemical reactions to complete themselves; more care to prevent phosphorus from being reabsorbed from the basic slag in the open-hearth; closer attention to features tending to reduce shrinkage pipes, gas holes and segregation in ingots; more care in rolling during the heavy reductions in the early passes in the blooming mills; care in keeping the right temperature to the end of the rolling; and proper appliances and skill for handling the rails on the cooling skids and in the process of cold straightening—all have helped to improve quality.

On the part of the consumer, it was thought by some that if the base was made thicker the section would be more symmetrical and the rail as a whole could be rolled cooler, because the heavier base would retain its heat more nearly equal with the head. It was thought also that the thicker base would not split and produce crescent brakes so readily as the thin bases. This reasoning seemed so sound that about 1907 two types of thick-base rails were designed by a committee of the American Railway Association, and they have been in service quite extensively for three years.

Further improvements in manufacture are constantly being made. Some things are tried which look good to their originators but which turn out badly and are dropped. But, unfortunately, while they are being tried, rails are necessarily made, with the result that unsatisfactory rails get into the track.

Rail steel does not strictly follow the rules which have been found satisfactory in the case of structural steel. Chromium and nickel have been tried as alloys in rails and have proved very unsatisfactory. The nearer absolute homogeneity can be approached the better the rail appears to be.

Segregation Troubles

Segregation seems at present to be our greatest enemy. This phenomenon cannot be wholly prevented. Its effect is to produce higher carbon, phosphorus, etc., in a part of the interior metal of the ingot than at the outside. In rolling, this interior portion becomes the central mass of the head and web. The filaments made up of the harder interior metal resist the stretching action of the rolls to a greater degree than the softer surrounding metal, and in consequence are in a condition of great initial tension in the completed rail. Some of our failures are due to these highly strained threads of metal giving way under the stress of service, leading eventually to a broken rail. The initial fracture, being interior, cannot be discerned until it reaches the outside of the metal. Rails that have given good service are found to contain segregated material, dark carbon streaks and other evidence of non-homogeneity. This fact leads to the belief that these imperfections are not fatal if present to a reasonable degree only.

As to the thick-base rails adopted by some roads after the studies of 1907, the only advantage that can be claimed for them is that they cool with less curve than the thin-base types. This is an advantage, because the less cold-straightening the better; but whether this one advantage is worth the cost of the metal added to the base is a question not yet settled.

Speaking generally in regard to form of section, it can be said that the slight advantage of one section over another is entirely lost sight of in the greater consideration of soundness of metal. It is a fact that the wearing qualities of the heavier rails of all types have not been satisfactory, in many instances. It is even claimed by many persons that the older rails of 80 lbs. per yard are giving better service than those of 100 lbs. of recent make. This fault of the heavier rails is variously ascribed to less work of reduction and to a higher finishing temperature.

The Preference for Open Hearth Rails

A large portion of the rail rolled in this country now is of open-hearth steel. This is due to the fact that ores low enough in phosphorus to use in the acid-lined Bessemer converter are growing scarcer, and also the impres-

*Presented at the Sixth Congress of the International Association for Testing Materials, New York, September, 1912.

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[1] The results can be found in the report on "Tests of Metals," three volumes, issued by the War Department, U. S. A., 1909.

sion among consumers that the open-hearth process should produce the better metal. There is no doubt that pig-iron made from Lake Superior ore is better adapted for melting on a basic than on an acid hearth; and, as basic Bessemer is out of the question in this country, open hearth by the basic process is the logical solution of the problem. Manufacturers demand $2 per ton more for open-hearth than for Bessemer rail, and buyers are paying this in the hope of securing more durable and more satisfactory rail.

The usual specification for phosphorus in open-hearth rail is, not to exceed 0.04, and in Bessemer 0.10 per cent.; carbon, for the former 0.63 to 0.76 per cent., and in the latter 0.45 to 0.55 per cent. It is quite sure that carbon is a safer and better hardener than phosphorus; and on account of the difference in the process it is claimed that the bath is less loaded with oxygen in the open-hearth than in the converter. These considerations, coupled with the established preference for open-hearth steel and the abandonment of Bessemer in bridge building, have influenced buyers in favor of the former, even in the face of its higher price.

Open-hearth rails are somewhat new both to the majority of our mills and to most of our railroads. The results from their use have not, so far, been fully satisfactory. The causes of this are now becoming better understood, with the result that when conditions are favorable these rails show their superiority over Bessemer. Nothing is more certain than that simply changing from the Bessemer to the open-hearth process will not insure a radical improvement in rails; nor is there any panacea that can be applied by a turn of the hand that will bring about the improvement that a part of our public seems to think possible.

The so-called duplex process, in use at mills fitted with both Bessemer converters and open-hearth furnaces, appears to be an economical and proper method of producing steel for rails. It consists in burning out the carbon and silicon in the acid converter and then charging the bath into the basic open-hearth furnace where the phosphorus is reduced and the process is completed.

Titanium has been used to a considerable extent as a deoxidizer with apparently favorable results. It acts like vanadium, as a cleanser, and is not found in the completed product. Its cost adds from $1.50 to $2 per ton to the cost of the rails.

Recent Progress

Scientific committees working under the auspices of the American Railway Association, through the American Railway Engineering Association and the American Society for Testing Materials, are actively studying the rail-making question in close connection with the manufacturers. It is thought that valuable progress has been made, that improvements have been adopted at many mills which have manifestly improved the rails in quality, and that if the whole output could be insured to be as good as the best, all reasonable demands would be fulfilled.

It is certain that there is a better understanding between the manufacturers and consumers now than has at times existed in the past. Genuine efforts are being made to correct methods that are thought to lead to unsatisfactory results, and there is a spirit of willingness among all parties concerned to experiment on a liberal scale with a view to determining scientifically the effect on the finished rail of features of practice which have heretofore been discussed wholly from an academic standpoint. Accidents occur, and sometimes, though not often, can be ascribed to a defective rail. When this condition occurs the public may rest assured that all that can be learned from the trouble is learned by experts constantly concerned with the improvement of rails, and that the knowledge so obtained will be used to prevent the recurrence of similar cases.

The manufacture of steel of a sufficiently high grade for use in rails is a far more delicate operation than the making of milder steel such as is used for bridges. The recarburizing process, the passage of the molten steel from the ladle to the molds, the condition of the molds and of their stools, and the handling of the ingot to the soaking pit, are delicate features. The setting of the steel, that is, its change from the fluid to the solid state, is a wonderfully delicate natural phenomenon. Steel is a compound intermediate in composition between wrought iron and cast iron. It is more unstable than either, and in the process of solidifying it gives up part of the contained metalloids to adjacent metal more fluid than it. Gases, especially oxygen (and probably hydrogen), are entrained in it while fluid; chemical salts due to the recombinations during the deoxidizing and recarburizing process are formed; and the wonder is that the metal is as solid and homogeneous as it is. The difference of the temperatures at which the various contained ingredients solidify is a disturbing factor, and the intricate interdependence of all these features, the chemical changes going on and the precise temperature at which these changes occur, render the problem too complex for scientific analysis beforehand. Long practical experience alone can fix upon the exact procedure necessary to produce the best results. As certain practices are proved to be good they are adopted, while those which apparently lead to occasional bad results are abandoned. However, it takes two or three years to develop these conditions, good and bad, and trace them back to their sources.

American Steel & Wire Company's Buffalo Warehouse

The American Steel & Wire Company has opened a large warehouse and distributing depot at Buffalo, N. Y. It is located at 337 Washington street. A four-story and basement building has been leased for the company for a term of years by Allan Fraser, its local representative and manager of sales for western New York. The building has been remodeled throughout for the company's use. New freight elevators have been installed and all modern warehouse conveniences have been provided, including a suite of finely equipped offices. The new warehouse has been stocked with a full line of all the company's manufactures in wire products, including wire rope and insulated wires, and was opened for business September 2.

The establishment of a warehouse in Buffalo is in accordance with the policy of the company to give the quickest possible service in sections of the country where it does business on a considerable scale. The large industrial and building development in Buffalo and on the Niagara frontier has been so rapid in the past two years that the location of a distributing warehouse in that territory to insure quick deliveries became a necessity.

Heretofore the American Steel & Wire Company's lines were only partially covered by the representative located in Buffalo. With the recent appointment of Mr. Fraser, who was formerly connected with the New York office of the company, to the managing position at Buffalo, it was decided to have all lines fully represented in that territory under his direct charge.

General Electric Pensions

The General Electric Company has announced an extensive pension system. It is planned to pension the male employees who have been in the service of the company for 20 or more years and who have reached the age of 70 years, and those female employees who have been with the company a like number of years and who have reached the age of 60 years. Employees may be pensioned if incapacitated for work after the ages of 65 for men and 55 for women. The pension in all cases will consist of 1 per cent. of the average yearly wage for the 10 years preceding the employee's retirement, multiplied by the number of years he has been employed by the company. No employee shall receive more than $125 a month.

A syndicate of Buffalo capitalists headed by Daniel E. Knowlton, president of the Buffalo Cold Storage Company and the Knowlton Warehouse Company, has purchased Squaw Island, lying between Niagara River and Black Rock Harbor, Buffalo, N. Y., and will develop on it a lake, barge canal and railroad terminal, with warehouse and industrial facilities. Plans are being made somewhat similar to the Bush Terminal in Brooklyn. The island has an area of 130 acres, with over two miles of river and canal frontage. The International Bridge crosses its center and most advantageous railroad facilities can be provided.

Typical American Uses of Cast Iron*

The Properties Needed, Recent Progress in Meeting These Needs and the Tests Necessary to Define Desired Properties

BY JOHN JERMAIN PORTER, STAUNTON, VA.

American foundry practice has made great progress in passing from the empirical stage to that of scientific control. A most important feature, the use of chemical analysis as a basis for mixing irons, is now practically universally adopted, but much still remains to be done both in the more efficient use of chemistry and in the adoption of other scientific methods of control.

It is now becoming quite widely recognized that chemical composition is not the only factor determining the properties of cast iron, but, although the importance of structure is known, the methods of metallography have received very little attention from foundries and users of castings. It is true that investigators have used the microscope on cast iron with valuable results, but this method of control has not yet been generally taken up in practice as in the case of steel. The two reasons which apparently account for this neglect are: First, the fact that foundries, being operated in smaller units, have as a rule less technical skill available at each individual plant; and, second, that the more complex structure of cast iron makes the interpretation of its microstructure much more difficult. It is probable that much of the metallurgical progress of the near future will be along this line.

The theory that oxygen and nitrogen may be present in cast iron and are accountable for some otherwise inexplainable phenomena is gaining ground among practical foundrymen, and means of eliminating these elements are being widely adopted. Greater care is being given the cupola process, and the use of ferromanganese, silicon, vanadium and titanium as deoxidizers is rapidly increasing. Ferroalloys are also rather extensively used to correct the composition of the iron in the ladle.

Since cast iron is used for a wide variety of purposes, it is obvious that the properties by which its value is measured and the tests to which it is subjected should be different for each class of castings. Hence it is necessary to consider each class separately. It is true that current practice does not as a rule adequately recognize this fact, and almost the only test which is commonly applied is that for transverse or tensile strength, although this property in many or perhaps the majority of cases is not of chief importance. There are but few foundries in this country devoting attention to getting special properties in this material, and to most foundrymen, as well as users, cast iron is simply cast iron, and a casting is satisfactory when true to pattern and free from visible defects.

The succeeding portion of this paper will discuss some characteristic American uses of cast iron, the properties needed, recent progress in meeting these needs, and the tests necessary to define the desired properties.

I. Machinery Castings

A large percentage of machine parts are made of cast iron which material is especially adapted for this use on account of the ease with which it is cast and machined into the desired shape. The more important properties desired in machinery castings are softness, strength, and a fine grain structure, in addition, of course, to freedom from visible defects such as blowholes, cracks, shrinkage cavities, etc.

It is an easy matter to make soft castings, but to get the combination of easy machining properties, strength, and close grain, as demanded by some users, has proved a difficult proposition to many foundries. Especially is this true as to closeness of grain and the ability to take a high polish, so desirable on many finished parts. The solution has been reached in various ways. The use of charcoal iron is one method, satisfactory except from the standpoint of cost. Certain brands of coke irons are found to give greater strength and closer grain for a given softness than others, and the knowledge of such mixtures is a valuable asset to the practical founder. Another method is found in the use of steel scrap in the cupola mixture, making the so-called semi-steel, which gives a closer grain structure and considerably more strength without material change in composition. The treatment of the metal with certain ferroalloys has also been found advantageous in this connection.

The buying of machinery castings would be greatly simplified if definite limits of hardness, strength, and grain size could be specified. Satisfactory methods for testing hardness are found in the drill test and the Shore scleroscope, most of the various other proposed methods being too cumbersome for commercial use. The drill test, simulating as it does actual machining operations, gives the more reliable results, while the scleroscope possesses the advantage that it can be used directly on the casting without in any way injuring it.

For testing the strength of cast iron there are available the ordinary transverse, tensile and compressive tests, the first of which is, in the opinion of the writer, preferable. In the testing of strength (and hardness also) it must be remembered that the properties of cast iron depend in part upon the thickness of the section, and hence that, in cases where it is not possible to test the casting itself, the test piece should at least approximate the section of the casting. Probably three standard sizes of test bars could be selected, to represent the three classes of light, medium and heavy castings. The broken ends of these bars could be then used for the drill test to determine hardness.

For grain size there is no practical test available—a serious lack, as in many cases this property is of the greatest importance. Possibly something might be done with a planimeter used on a microphotograph of standard magnification; a rough test, of value in some cases, can be made by comparing the fracture of a broken test bar with a scale made of previously broken test bars of varying grain size.

The freedom from blowholes and other casting defects is best determined by ocular inspection. Unfortunately there is no method of inspecting the interior of the casting without destroying it, and while the tendency of the iron to shrinkage, blowholes, etc., can easily be tested, such tests would be of doubtful utility since these troubles are frequently, if not usually, due to faulty molding and pouring.

II. Hydraulic Work

Cast iron is still very generally used for this class of work, on account of the ease with which it is formed into shape, although there has been some attempt to substitute steel for very high pressures. The properties desired in the metal are practically the same as in the preceding case, except that they stand in a different order of importance, close grain and freedom from shrink-holes and spongy places being the first consideration. Much the same means are used to obtain the combination of density, strength and the ability to machine easily, but as the importance of density is greater in this case, the use of special means, such as charcoal irons, steel scrap and ferroalloys, is more frequent.

The most direct and satisfactory test for hydraulic work is to subject the casting itself to some specified hydraulic pressure. In many cases, however, the casting cannot be so tested until a good deal of expensive machine work has been done on it, and in this event it seems advisable to specify the strength and hardness tests previously described. The hardness test should be used in any case, as the bursting strength does not, of course, give any idea as to machining properties. A test for grain structure

*Presented to the International Association for Testing Materials, Sixth Congress, New York, September, 1912.

would be especially valuable in connection with this class of work.

III. Electrical Machinery

For parts where high electrical permeability is of prime importance, cast iron has been largely displaced by steel, but in the majority of cases it still holds its own on account of the greater ease of forming. The permeability of cast iron, although always low as compared with that of the purer forms of iron, can be considerably improved by keeping the manganese very low and the silicon quite high. In practice, however, not much attention is usually given to this property, since the greater number of castings are used in parts of machines not carrying the magnetic lines of force, and hence having requirements not different from ordinary machinery castings.

In electrical castings a permeability test used in conjunction with strength and hardness tests should be sufficient to define the quality of the material. Since permeability probably bears a fairly close relation to chemical composition it might be possible, although certainly less satisfactory, to specify analysis in place of permeability direct.

IV. Heat-Resistant and Chemical-Resistant Castings

A large variety of castings come under this head; the best known examples are probably ingot molds and grate bars. Only a few foundries are giving attention to producing castings of these special properties, and there is but little generally available information. Grate bars, for example, are ordinarily made of the cheapest possible mixture irrespective of its quality as regards service. In the case of ingot molds, on the other hand, some pains are taken to obtain the special quality of heat resistance, and a low phosphorus iron is always used for this purpose.

There are no tests for heat resistance and chemical resistance of cast iron in common use. For heat resistance it is a very difficult matter to devise any single test which will answer for all classes of castings, since the effects of heat are manifested in several different ways. Chemical analysis may be specified with advantage in some cases, since the melting point of cast iron depends chiefly on this factor. Resistance to the action of chemicals can be tested directly without much difficulty in a manner similar to the accelerated corrosion test used on steel. There is, however, great need for the standardization of all conditions under which such tests are made, so that comparable results may be obtained.

V. Chilled Cast Iron Car Wheels

These form one of the most interesting applications of cast iron in American practice. The service conditions for these wheels are very severe. The load on each wheel often amounts to between 10,000 and 20,000 lb. They are constantly subjected to heavy blows due to pounding at rail joints. The friction of the brake shoes induces severe heat strains in the tread. Finally the users of these wheels demand that they have a high resistance to wear. Owing to the nature of their service any failure is apt to be attended with very serious results, and hence great pains must be taken to insure a uniformly high quality of product.

The results desired are produced by the use of both special materials and special methods of casting. Formerly charcoal iron was used exclusively for this class of work, but now coke iron enters largely into the mixtures. The problem of a high-grade mixture has been much complicated by the necessity of remelting the old wheels, with their usual high content of sulphur. A partial corrective for the excessive amount of scrap which it is often necessary to use is found in the addition of ferromanganese, and there have also been obtained some encouraging results through the use of ferrotitanium.

The special methods of casting consist in the use of a circular chill in that part of the mold forming the tread of the wheel. This method has been frequently described and needs no discussion. With the proper percentage of silicon this results in the tread being chilled to a depth of about ¾ in., back of which is tough gray iron. The chilled tread is, of course, intensely hard and exceedingly resistant to wear, while the wheel as a whole is very tough and has proved eminently satisfactory in service. Steel wheels, long used on passenger cars, have recently been substituted on freight cars at very high capacity. They are, however, much more expensive and in some cases have not proved entirely satisfactory as to wear, so that there is every indication that the cast iron car wheel will hold its own for a long time to come.

The specifications and tests required for car wheels have been so often published and are so readily accessible that they need not be repeated at length. Briefly summarized the tests are carried out on a certain number of the castings themselves, and consist chiefly of a drop test to measure the resistance to shock and blows, a heat test made by pouring molten iron around the tread of the wheel, to measure the resistance to heat strains, and measurements to verify dimensions. It would appear that a hardness test on the chill might advantageously be added, in view of the known variation in the hardness of chilled iron. A test for wearing quality would be better still, but no satisfactory test of this sort is in sight.

VI. Chilled Rolls for Rolling Mills

Cast iron rolls still hold their own in sheet mill and some other classes of finishing work, although cast iron has been quite generally displaced by steel for the heavier service. In this case the service conditions are not unlike those to which car wheels are subjected, but they are even more severe as to heat strains. Moreover, owing to the great thickness of the castings the initial shrinkage strains are very great. The use of the very best grades of charcoal iron, together with air-furnace melting, is generally recognized as necessary for the successful manufacture of chilled rolls, chiefly on account of the difficulty with cracking due to heat strains. It is reported that the use of vanadium in chilled rolls is adding considerably to their wearing qualities.

For this class of castings there are no satisfactory tests in sight. It is inconceivable that any tests could be of value which are not made on the roll itself, and, while a difficult proposition it is possible that in time a set of tests similar to those used on car wheels may be devised.

VII. Brake Shoes

Brake shoes may serve as an example of the many smaller specialities which are made of cast iron. The requirements here are long life, with this limitation: that the hardness of the brake shoe must be less than that of the wheel so that the wear will not be on the wheel. A close grain structure is advisable, and in some cases at least is being obtained by the use of steel scrap in the cupola mixture.

For brake shoes a wearing test used in connection with hardness limits would best define their quality. No satisfactory method of testing resistance to wear is in sight, but it would seem that specifications for hardness alone could be advantageously used pending the development of such a test.

VIII. Cast Iron Pipe

In point of tonnage, pipes are probably the most important castings made in this country. Cast iron is a particularly suitable material for pipes which are to be placed underground, on account of its relative resistance to corrosion as compared with steel and other commercially available materials. Competition is keen in this line, so that low-priced iron is necessary. Within the limitations set by price, close grain and strength are desirable, while hardness must be kept within such limits as will permit of a small amount of machine work.

In regard to the properties of the metal, none of the present specifications for cast iron pipe lays stress on anything other than strength as determined on a separately cast test bar. A test for bursting strength and freedom from leakage made directly on the pipe would, of course, be a more accurate index of utility, but is probably too cumbersome for practical use. The transverse strength determination is probably as satisfactory as any simple test could be, but might with advantage be supplemented by specifying hardness limits.

IX. Stoves and Furnace Work

Malleable cast iron and steel have been tried for stoves, but while they have perhaps a place, gray cast iron has proved more satisfactory and has steadfastly held its own. The service requirements here are resistance to the action

of heat, resistance to warping, and a certain degree of strength. However, as these castings are very thin and are frequently highly ornamented, a very fluid iron is essential, and in practice the service requirements are deliberately ignored to facilitate manufacture. Resistance to heat requires low phosphorus, and resistance to permanent expansion, which causes warping, demands low silicon, but both phosphorus and silicon are invariably carried high in this class of work, to increase fluidity and make it easier to produce perfect castings. However, the product of our stove foundries is fairly satisfactory in service, and in appearance and finish has reached a high degree of perfection.

Specifications for stove and furnace castings should include tests for strength, hardness (since many parts have to be drilled), and resistance to heat. There is no trouble in regard to the first two tests, but, as previously stated, no good method has yet been devised for gauging heat-resistant qualities. Specification of chemical analysis can be used with advantage, but cannot be regarded as a really satisfactory substitute for the much needed direct test for heat resistance.

There are of course innumerable other uses of cast iron which might be described, but to make the catalogue complete would be an interminable task. In conclusion the fact should be emphasized that in many cases it is not possible to do much in the way of formulating specifications on account of the lack of suitable methods of testing the properties. The apparent inclination of many users of castings to entirely ignore the quality of their material may be largely attributed to the lack of any definite numerical means of gauging quality.

Mayari Foundry Pig Iron

Results from Its Use for Chilled Castings and Those Made for Special Requirements

A recent development in the foundry iron trade is the introduction of Mayari pig iron for use in the manufacture of chilled castings and castings calling particularly for strength and homogeneity of metal. While the Mayari steel of the Pennsylvania Steel Company and the Maryland Steel Company is familiar, it is not so generally known that these companies also market some of the pig iron made from the ores of their Mayari mines in Cuba. The unusual features of Mayari pig iron are the chromium, nickel and cobalt content, the relation of combined and graphitic carbon and the presence of titanium and vanadium with low content of silicon and phosphorus. Where 100 per cent. of Mayari ore is used in the blast furnace burden the result is an iron running 2.50 to 3 per cent. in chromium and 1.25 to 1.50 per cent. in nickel and cobalt. A mixture containing 50 per cent. Mayari ore will yield half the above percentages of chromium, nickel and cobalt, the chromium being always approximately double the nickel and cobalt.

Chemical and Physical Characteristics

The relations between combined and graphitic carbon and the corresponding percentages of silicon and chromium are indicated in the following analyses of various samples of Mayari pig iron. The high amount of combined carbon is noteworthy. In all the seven analyses given the sulphur was below 0.03 per cent.:

Silicon, Chromium and Carbon in Different Casts of Mayari Pig Iron

Si.	Cr.	C.C.	G.C.
0.38	2.67	3.808	0.472
0.47	2.78	3.822	0.400
0.75	2.86	3.726	0.436
1.08	2.50	3.621	0.623
1.22	2.56	3.498	0.636
1.48	2.69	3.060	1.360
1.66	2.77	2.558	1.660

Titanium in percentages varying from 0.05 to 0.30 per cent. is contained in Mayari pig iron, varying with the percentage of silicon, the 0.05 titanium occurring in iron showing 0.22 silicon, and 0.30 titanium in an iron having 1.80 silicon. The tendency in the manufacture of Mayari iron is to low silicons, the average being under 1 per cent. A typical complete analysis of the iron is as follows:

	Per Cent.		Per Cent.
Carbon	4.67	Chromium	2.66
Manganese	0.90	Vanadium	0.05
Phosphorus	0.047	Titanium	0.18
Sulphur	0.011	Copper	0.035
Ni. and Co.	1.30	Silicon	0.80

Physically Mayari iron is similar to spiegeleisen, showing a white crystalline fracture with no grain. The iron is extremely brittle and breaks up on the casting machine, and in being loaded by hand in cars produces a considerable amount of spawls and slivers. In its natural condition its use is limited to the manufacture of steel, but it becomes useful in the manufacture of iron castings when mixed with other irons, the percentage varying with the use to which the alloy iron is put.

In the general run of foundry work for miscellaneous castings it has been found that an addition of 10 to 15 per cent. of Mayari iron to the regular foundry mixture, keeping the phosphorus about 0.6, produces castings of unusual strength with homogeneity of metal and surface. For foundry work where 26,000 lb. tensile strength and 3200 lb. transverse strength are required the following mixture has been found of advantage:

40 per cent. foundry scrap.

13 per cent. Mayari iron containing 2.00 chromium and 1.00 nickel.

47 per cent. foundry iron containing 2.50 silicon, 0.60 to 0.70 manganese, with sulphur under 0.04, and phosphorus 0.65 to 0.80.

With the continued use of Mayari iron the scrap will gradually acquire Mayari characteristics and less pig iron will be needed, the mixture then becoming approximately 40 per cent. scrap, 10 per cent. Mayari iron and 50 per cent. foundry iron. For air furnace work 10 per cent. to 15 per cent. of Mayari iron has been used, giving castings with 40,000 lb. tensile strength.

For Chilled Rolls

It is stated that chilled rolls containing 20 to 30 per cent. Mayari pig iron have given three to four times the service of ordinary chilled rolls. The finishing rolls used in the manufacture of rails at Steelton and Sparrows Point have averaged more than twice the life of the ordinary roll. A deeper chill than the usual is secured, with the desired feathery appearance between the chill and the grain iron. A very long life has been found for Mayari rolls used in cold rolling. The iron has also been used in the manufacture of pipe balls, bending boxes and guides, and for special castings where resistance to heat or abrasion is called for, also for cylinders and other castings calling for close-grained, clean-finished surface.

Lackawanna Steel Sheet Piling

An attractively illustrated pamphlet known as bulletin No. 104 has been issued by the Lackawanna Steel Company, Buffalo, N. Y., descriptive of its protected steel sheet piling, which is the regular steel sheet piling covered with concrete that is applied before driving. This piling is particularly suitable for sea or retaining walls built on soft material, for use in construction work as a substitute for the ordinary type of mass concrete or timber walls where local conditions render these forms undesirable, where the piling is exposed to corrosive action, or where quick action is required in the construction or repair of permanent foundations, etc. The advantages of using either the center-flange, the arched-web or the straight-web types are brought out and all of these are illustrated. Typical cross-sections are shown of projects upon which this piling can be used and there are halftone engravings showing the piling in place for raising the battleship Maine, on the Niagara River Canal and in connection with the erection of the Woolworth Building, New York City. The material furnished for the Niagara River Canal was the largest steel sheet piling order ever placed. Illustrated descriptions of the arched-web piling without the concrete protection and the raising of the Maine appeared in *The Iron Age*, June 20, 1912, and June 8, 1911, respectively.

The Canadian Lead Bounty.—As the price of lead in London now exceeds £15 per ton, the Canadian bounty of $15 per ton to domestic lead producers automatically ceases, according to law. These bounties expire at the end of the year.

The stockholders of the Hamilton Otto Coke Company, Hamilton, Ohio, met last week and elected the following officers: President, E. M. Peters; vice-president, J. C. Thoms; secretary and treasurer, E. C. Seemers, all of Cincinnati. Nothing has been given out as to starting up the plant that has been idle for nearly 18 months.

Michigan Workmen's Compensation

New Law in Effect September 1

John J. Whirl, secretary of the Employers' Association of Detroit, has favored us with a budget of documents relative to the Michigan workmen's compensation act which became operative September 1. The budget comprises a copy of the act; a review of the act by Wade Millis, member of the Legal and Legislative Committee of the association; an address explanatory of the act delivered before the association April 16 by Chester M. Culver, then chairman of the Legal and Legislative Committee; a circular letter from the secretary to the members advising them that it is deemed necessary that they not only elect as indicated their acceptance of the act, but also to safeguard their interests by insisting that all employees also accept the provisions of the law; copies of eight blanks or forms authorized by the Industrial Accident Board; a poster to be placed above factory time clocks, officially announcing to employees the acceptance of the act by the employer.

Pressure on our columns prevents the reproduction of the law, which is necessarily long, as it enters minutely into details. The following syllabus, which covers the main points, is taken from the review of Mr. Millis above referred to:

"The workmen's compensation law of Michigan was signed by the Governor on March 20 last, and will go into effect on September 1, 1912. The act does not apply to domestic servants and farm laborers, but with respect to other employees the common law defenses of contributory negligence, fellow servant rule and assumption of risk are abolished in actions to recover damages for personal injury sustained in the course of employment, or for death resulting therefrom. Employers accepting the compensation feature of the law are not deprived of these defenses, however, if the employee chooses to recover by action at law.

"The compensation feature of the law is compulsory as to the State and its subdivisions, and elective as to all other employers. Such election on the part of the employer is made by filing a statement with the Industrial Accident Board, and may be terminated by filing a notice to that effect at least 30 days prior to the expiration of the first or any succeeding year. When the employer has accepted the compensation plan his employees are deemed to have accepted unless contrary notice is given. The compensation provided by the act includes reasonable medical and hospital services for the first three weeks after the injury, and in addition payments based upon the earnings of the employee, as follows:

"In case of death, when the deceased leaves one or more persons wholly dependent upon his earnings for support at the time of the injury, a weekly payment equal to one-half his weekly wage for a period of 300 weeks from the date of the injury. In case the deceased leaves dependents only partly dependent upon his earnings for support, the compensation is proportioned according to the amount contributed by the employee to such partial dependents at the time of his injury. In case of the deceased leaving no dependents the employer is required to pay the reasonable expenses of his last sickness and burying, not exceeding $200. In case of an injury resulting in total incapacity the compensation is at the rate of one-half of the average weekly wages of the employee for a period not greater than 500 weeks, the aggregate compensation not to exceed $4,000. In no case shall the weekly payments be more than $10 or less than $4. In case of partial incapacity for work, resulting from injury, the scale of compensation varies with the nature of the injury according to the schedule set forth in the law. No compensation is paid for any injury which does not incapacitate the employee for a period of at least two weeks from earning full wages. If the disability extends beyond two weeks compensation shall begin on the fifteenth day after the injury. If the disability continues eight weeks or longer the compensation shall be computed from the date of the injury.

"The act provides four methods for paying the compensation: First, it may be paid directly by the employer upon his furnishing satisfactory proof to the Industrial Accident Board of his solvency and financial ability; second, by insuring against such liability in any employers' liability company authorized to take such risks in the State; third, by insuring against such liability in any employers' insurance association organized under the laws of the State; fourth, by contributing to an 'accident fund' in the hands of the State under the administration of the Commissioner of Insurance. It is optional with the employer as to which of the four methods he will adopt.

"An Industrial Accident Board is created by law to which disputes and controversies concerning compensation shall be submitted. All agreements between employers and employees as to compensation must be filed with and approved by the board before they shall be deemed final and binding upon the parties thereto. In case of failure to reach an agreement as to compensation, either party may notify the Industrial Accident Board, who shall thereupon appoint a committee of three, one of whom shall be a member of the Industrial Accident Board, and the other two named respectively by the two parties. After the arbitration committee has reached a decision it shall stand as the decision of the Industrial Accident Board, unless a claim for review is filed by either party within seven days. If claim for review is filed the Industrial Accident Board shall review the decision of the Arbitration Committee. The finding of facts made by the Industrial Accident Board shall be conclusive in the absence of fraud, but the Supreme Court may review questions of law involved in any final decision of the board provided application is made by the aggrieved party within 30 days after such decision by certiorari, mandamus, or by any other method permissible by the rules and practice of the court. A certified copy of any decision of the Industrial Board or an Arbitration Committee, when no claim for review is made, may be presented by either party to the Circuit Court of the county in which the accident occurred, upon which the court shall, without notice, render a judgment in accordance therewith, which shall have the same effect as though duly rendered in an action and determined by the court."

Industrial Accidents in Wisconsin

In a recently issued bulletin, the Industrial Commission of Wisconsin says that 5241 accidents, each having occasioned a disability for more than seven days, were reported in that State from July 1, 1911, to June 30, 1912. Of this number 873 occurred in foundries and metal working industries; 186 in iron and steel mills and 195 in manufactures using iron and steel products, including shipbuilding, wagon factories, etc. A sub-classification shows that emery wheels, presses, falling objects, molten metal and handling of heavy pieces were the most common causes of injury. The commission finds that injury to a foundryman, caused by a mold breaking and hot metal running over his right foot, could have been avoided had he worn congress shoes, which shed hot metal and are quickly removable. Death caused by a bursting emery wheel is attributed to failure to equip the wheel with a hood. Injuries resulting in amputation of fingers and thumbs, received while oiling or wiping machinery, and other accidents caused by set-screws, belts, pulleys, shafting, gears and elevators are charged to lack of proper guards. The commission finds that a workman's fall into a pit would have been prevented had a suitable railing been provided. Perusal of the commission's monthly bulletins is recommended to manufacturers as a reminder of precautions that should be taken for the safety of workmen.

The Erie Railroad Company has signed a contract with the Grade Crossing Commission of the city of Buffalo for the elimination of nine grade crossings. The construction of the subways and viaducts required will involve the expenditure of about $1,000,000. Edward B. Guthrie, engineer for the commission, Ellicott Square Building, Buffalo, has been authorized to advertise at once for bids for the construction of subways under the Erie and the Lackawanna at Delaware avenue.

Advance reports received in St. Louis from the United States Geological Survey show that Missouri in 1911 produced 178,868 net tons or 44 per cent. of all the lead turned out in the United States.

Steel Production in the First Half of 1912

The American Iron and Steel Institute's Statistics for Ingots and Castings and for Iron and Steel Finished Rolled Products

From the office of the American Iron and Steel Institute, New York, James T. M'Cleary, secretary, we have an advance proof of the statistics of production of steel ingots and castings and of iron and steel finished rolled products in the United States in the first six months of 1912, as compiled by Howard H. Cook, assistant secretary and statistician. They show that, as was the case for the first time in 1911, the production of steel ingots and castings exceeded that of pig iron in the first half of this year. Ingots and castings amounted to 14,373,701 gross tons, while pig iron output, as heretofore reported, was 14,072,-274 gross tons. The excess of steel was thus more than 300,000 tons—a remarkable indication of the expansion in steel consumption this year, as distinguished from consumption of the products of the foundry and the iron rolling mill. Of the 14,373,701 tons of ingots and castings produced in the first half of the year, 9,441,706 gross tons consisted of open hearth steel, 4,868,306 gross tons of acid Bessemer steel and 63,689 gross tons of all other kinds of ingots and castings.

The statistics are issued as "The First Semi-Annual Statistical Report of the American Iron and Steel Institute." The steel ingot figures have been collected annually heretofore, so that no direct comparison can be made with the first half of 1911. The report says on this point: "The total pig iron production did not vary greatly in the first half and in the last half of the year 1911, being 11,-666,996 gross tons for the first six months as compared with 11,982,551 tons for the remainder of the year. It would seem fair, therefore, to make comparisons between the ingot production for the first half of 1912 and one-half of the ingot production of 1911. It should be borne in mind, however, that such comparisons are only approximately correct. On this basis the total production of ingots and castings for the first six months of 1912 shows an increase over the estimate for the similar period of 1911 of 2,535,648 gross tons, comprising an increase of 1,642,381 gross tons of open hearth steel and 894,379 tons of Bessemer steel, and a decrease of 1,112 tons of all other steel."

Total Production of Ingots and Castings

The total production of ingots and castings in the first six months of 1912, divided according to processes, is given below in gross tons, and comparison is made with the five years 1907-1911.

	Open hearth.	Bessemer.	All other.	Total.
1907	11,549,736	11,667,549	145,309	23,362,594
1908	7,836,729	6,116,755	69,763	14,023,247
1909	14,493,936	9,330,783	130,302	23,955,021
1910	16,504,509	9,412,772	177,638	26,094,919
1911	15,598,650	7,947,854	129,602	23,676,106
1912 (6 mos.)	9,441,706	4,868,306	63,689	14,373,701

The above figures are separated into ingots—Bessemer, open hearth and all other—and castings—Bessemer, open hearth and all other—in the tables below:

Total Production of Ingots—Gross Tons.

	Open hearth.	Bessemer.	All other.	Total.
1907	10,803,211	11,634,276	121,990	22,559,477
1908	7,524,952	6,096,196	55,879	13,677,027
1909	13,892,896	9,296,969	108,914	23,298,779
1910	15,641,158	9,354,437	158,492	25,154,087
1911	15,027,459	7,890,753	111,267	23,029,479
1912 (6 mos.)	8,992,860	4,838,765	51,858	13,883,483

Total Production of Castings—Gross Tons.

	Open hearth.	Bessemer.	All other.	Total.
1907	746,525	33,273	23,319	803,117
1908	311,777	20,559	13,884	346,220
1909	601,040	33,814	21,388	656,242
1910	863,351	58,335	19,146	940,832
1911	571,191	57,101	18,335	646,627
1912 (6 mos.)	448,846	29,541	11,831	490,218

Crucible and Miscellaneous Steel

The total production of steel ingots and castings other than Bessemer and open hearth in the first half of 1912, as given in the first of the preceding tables, was 63,689 gross tons—53,476 tons of crucible steel, 6882 tons of electric or electrically refined steel and 3331 tons of miscellaneous steel, including cemented bars. The following table shows the distribution of the "other steel ingots and castings":

	Crucible.	Electric.	Miscellaneous.	Total.
1907	131,234	.....	14,075	145,309
1908	63,631	.....	6,132	69,763
1909	107,355	13,762	9,185	130,302
1910	122,303	52,141	3,194	177,638
1911	97,653	29,105	2,844	129,602
1912 (6 mos.)	53,476	6,882	3,331	63,689

The production of crucible steel in the first half of this year was 45,281 tons of ingots and 8195 tons of castings; of electric steel, 6359 tons of ingots and 523 tons of castings; of miscellaneous steel, 218 tons of ingots and 3113 tons of castings.

Open Hearth Ingots and Castings

The open hearth ingots and castings are divided according to acid and basic in the following table:

Open Hearth Ingots and Castings—Gross Tons.

	Ingots		Castings		
	Basic.	Acid.	Basic.	Acid.	Total.
1907	9,912,839	890,372	366,476	380,049	11,549,736
1908	6,985,420	539,532	155,005	156,772	7,836,729
1909	13,111,467	781,429	306,005	295,035	14,493,936
1910	14,858,353	782,805	433,976	429,375	16,504,509
1911	14,419,306	608,153	266,626	304,565	15,598,650
1912 (6 mos.)	8,689,144	303,716	238,435	210,411	9,441,706

Rail Production

The total production of rails of all kinds for the first six months of 1912 was 1,466,565 gross tons. The total production for the calendar year 1911 was 2,822,790 tons. The production of rails for the five years 1907-1911 is given in the table below. In 1911 the system of classification was changed. For the years 1907-1910 inclusive the figures given under "all other rails" represent iron rails only. In 1911 the total of 92,447 gross tons includes 234 tons of iron rails, 462 tons of electric steel rails and 91,751 tons of rerolled rails, which could not be classified by manufacturers. In previous years these rails had been added to the Bessemer and open hearth production, the larger part being classed as Bessemer. In the first half of 1912 the output of "all other rails" was 43,134 gross tons, of which 142 tons was of electric steel and 42,992 tons rerolled rails. No iron rails were reported.

Production of Rails, 1907-1912.

Year.	Bessemer.	Open hearth.	All other.	Total.
1907	3,380,025	252,704	925	3,633,654
1908	183,869	687,632	1,049,514	1,921,015
1909	1,767,171	1,256,674	.....	3,023,845
1910	1,884,442	1,751,359	230	3,636,031
1911	1,053,420	1,676,923	92,447	2,822,790
1912 (6 mos.)	496,927	926,504	43,134	1,466,565

The distribution, according to weight, was as follows, gross tons:

Year.	Under 45 lb.	45 lb. and less than 85 lb.	85 lb. and over.	Total.
1907	295,838	1,569,985	1,767,831	3,633,654
1908	183,869	687,632	1,049,514	1,921,015
1909	255,726	1,024,856	1,743,263	3,023,845
1910	260,709	1,275,339	2,099,983	3,036,031
1911	218,758	1,067,696	1,536,336	2,822,790
1912 (6 mos.)	123,684	511,523	831,358	1,466,565

Of the 43,134 tons of rerolled rails in the first half of this year, 41,973 tons was under and 1019 tons over 45 lb.

Finished Rolled Products

The following table gives the production of finished rolled iron and steel for the first six month sof 1912 showing separately the production of rolled iron and rolled steel as well as the total tonnage for fifteen classes of product. Semi-finished rolled products intended for further rolling, such as blooms, billets, slabs, sheet and tin bars, have not been included. Plates include production rolled to No. 12 gauge or thicker and sheets, production rolled to No. 13 gauge or thinner. The production of

black plate for tinning and of tie plates included in the body of the table under sheets and plates are seperately stated at the foot of the table.

Production of Finished Iron and Steel Rolled Products First Six Months of 1912—Gross Tons.

Finished Rolled Products.	Iron.	Steel.	Total.
Plates and sheets:			
Plates—No. 12 gauge and thicker	30,917	1,567,310	1,598,227
Sheets—No. 13 gauge and thinner	26,397	1,300,137	1,326,534
Total plates and sheets.....	57,314	2,867,447	2,924,761
Rails	.....	1,466,565	1,466,565
Nail plate	6,930	18,045	24,975
Structural shapes	.....	1,223,886	1,223,886
Wire rods	.....	1,220,004	1,220,004
Merchant bars	426,191	1,424,212	1,850,403
Bars for reinforced concrete.....	2,169	118,813	120,982
Skelp	141,355	989,063	1,130,418
Splice bars	14,761	92,020	106,781
Hoops	.....	130,345	130,345
Bands and cotton ties.....	12	204,322	204,334
Rolled forging blooms or billets...	1,066	187,771	188,837
Other finished rolled products.....	129,683	479,845	609,528
Total finished rolled products....	779,481	10,422,338	11,201,819
Black plates for tinning, included in plates and sheets above.....	1,057	498,294	499,351
Tie plates included in plates and sheets above	24,446	70,690	95,136

Comparison with the production of 1911 is not possible, except in the case of rails, structural shapes and wire rods, for the reason that data for other products have not yet been published. The following table gives the production of finished rolled products for the years 1909 and 1910, to which has been added the production for the first six months of 1912. An extensive study of the statistics of rolled iron and steel products is in preparation and will be published in connection with the final report. For comparison with the results set forth in the table below it may be stated that the production for the year 1911 of the three products at present available was: Rails, 2,822,790 gross tons; structural shapes, 1,912,367 tons, and wire rods, 2,450,453 tons:

Production of Finished Rolled Products in 1909 and 1910 and First Half of 1912—Gross Tons.

	1909.	1910.	1912. (6 mos.)
Plates	2,379,098	2,807,728	1,598,227
Sheets	1,855,248	2,147,756	1,326,534
Total plates and sheets..	4,234,346	4,955,484	2,924,761
Nail plate	63,746	45,294	24,975
Rails	3,023,845	3,636,031	1,466,565
Structural shapes	2,275,562	2,266,890	1,223,886
Wire rods	2,335,685	2,241,830	1,220,004
Merchant bars	3,263,531	3,785,731	1,850,403
Concrete bars	159,352	241,109	120,982
Skelp	2,033,381	1,828,194	1,130,418
Splice bars	200,283	223,022	106,781
Hoops	250,179	262,214	130,345
Bands and cotton ties.....	395,333	424,979	204,334
Rolled forging blooms.....	341,773	459,933	188,837
Other finished rolled products	1,067,674	1,250,568	609,528
Total finished rolled products.	19,644,690	21,621,279	11,201,819

The Growing Use of Motor Trucks

"It is the force of example that is causing the remarkable increase in the use of motor trucks," says George A. Kissel, president Kissel Motor Car Company, Hartford, Wis. "Some men do not seem to fully understand the great advantage of increasing the zone of delivery by five times or more the distance covered by horses. If they are using two delivery wagons or more and keeping them busy, a motor truck, under most conditions, would be a profitable substitute from the very start and still have time to do the work of another horse-drawn wagon when called upon to do so. It is easily enough figured, but many still wait for some competitor to give them a visual demonstration."

The Four-in-One Mfg. Company, Mishawaka, Ind., is occupying the building formerly used by the Amplex Motor Car Works, in which it is installing thoroughly modern machinery for the manufacture of ladders of all descriptions. It expects to start manufacturing operations September 16. It will make a specialty of extension stepladders. These stepladders are adjustable to several hights and are covered by patents allowed this year. Edward W. Forstbauer is president; David H. Turnbull, vice-president and general manager; William E. Zweigle, secretary and treasurer.

The High Cost of Living

A most interesting contribution to the discussion of the causes of the high cost of living by the head of one of Boston's largest dry goods houses is printed by the Boston News Bureau. It is as follows:

"The problem of the high cost of living seems to me to simmer down to the proposition that the demand for luxuries in the United States has been and is still increasing faster than the productiveness of labor. The problem grows more acute each year and in fact each month because that state of affairs continues. Up to about 10 years ago this statement would not hold true. The productiveness of labor had for years kept nearly apace with the increase in the demand for luxuries. Since Arkwright invented the cotton loom in 1775, the productiveness of labor has probably increased 1000 times and it would take the 90,000,000 people of America 10 years to make one year's supply of cloth were they dependent on the methods of 137 years ago.

"Up to the past decade this great and tremendous increase in the productiveness of labor brought about by revolutionary inventions was able to offset the corresponding increase in the demand for luxuries and no trouble arose over high prices. But now the situation is different. Since the early part of this century there has been absolutely no increase in the productiveness of labor but on the other hand there has been a decrease. This has been due to three causes: Few inventions, reduction of hours of labor and an inefficient working spirit. But the demand for luxuries persists and so prices rise.

"Under luxuries it is virtually necessary to include time-wasting, sports, amusements, automobiling, extravagant clothing, etc. It is apparent to any one that the demand for vacations, sports and an easier life in general is constantly on the increase. That is what is primarily meant by the demand for luxuries.

"Now the only way to meet this ever-growing demand is to increase production or the productiveness of labor. But how is that to be brought about? The era of inventions is virtually over and the efficiency of the individual laborer is being undermined by socialistic legislation and labor union tactics. The only solution would naturally be to increase the actual number of laborers, but the United States can't feed them. Therefore we are forced to run under capacity because we can't get the labor, which prefers the luxuries. Cotton and steel mills all over the country would be running at a much higher rate of production could they secure the help.

"When or where the rising tide of prices will stop is impossible to predict. Retrenchment is necessary, but that will never be effected voluntarily. A rapid revision of the tariff, a crop failure or a money stringency might produce it, but something drastic is required, because the ordinary laborer doesn't save unless he is put to it.

"The disagreeable phase of the whole problem thus is that to readjust the productiveness of labor to the demand for luxuries necessitates poor business. It's simply a case of Robinson Crusoe over again. After a summer of idleness Crusoe experienced his winter of starvation; and the day must come when the American people must retrench and turn the best part of their energies into productive labor. When that change occurs with sufficient violence, and not until then, will the mounting cost of living be halted."

The New Bureau of Foreign and Domestic Commerce

Announcement is made that in accordance with the act of Congress approved August 23, the Bureau of Manufactures and the Bureau of Statistics, both of the Department of Commerce and Labor, have been consolidated into the Bureau of Foreign and Domestic Commerce, which will continue the work heretofore carried on by the two bureaus in commercial, industrial, statistical, and economic lines, except the collation of internal commerce statistics, which was eliminated by Congress. The new bureau is, however, charged in addition with making investigations into the various elements of cost of production at home and abroad in respect to articles subject to duty, comparative wages and cost of living, degree of control by business combinations, and effect on prices.

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The Prolongation of Steel Trade Prosperity

The fact being fully settled that the steel trade has passed into a period of real prosperity, the question promptly is asked: "How long will it last?" The most recent period of prosperity lasted something like a twelvemonth, from about the middle of 1909 to about the middle of 1910. Then, while prices did not recede materially, operations came to be curtailed to such an extent that the unit cost of production increased. The preceding period lasted three years, from late in 1904 until late in 1907, though of course 1906 and 1907 were much more prosperous years than 1905, because prices moved up so slowly that 1905 did not participate largely in the advances. Prior to that there was a very prosperous period, from early in 1901 to early in 1903, and back of that was the boom of 1899, spectacular in character but of doubtful value. To which of these periods shall one liken the present?

As to the movement in open market prices, the present period has started much like all the others, with the exception of 1904-5-6, in which period prices advanced much more slowly. As to paying of premiums above the open market, for early delivery, the 1909 movement had little if anything of that, the 1905-6-7 movement had absolutely nothing, and that of 1901-2 very little. Comparison can hardly be made with 1899, for the simple reason that in that year the market took the bit in its teeth. There was really no open market except that for prompt delivery. The mills had all their forward material sold and were selling only the early material, to the inconvenience, not to say loss, of some other buyer.

As to the fundamental relation between the consumptive needs of the country and the productive capacity, the comparison is on the whole very favorable. Under normal business conditions the consumptive requirements increase with great steadiness. Productive capacity, on the other hand, advances by fits and starts. It is well to impress our minds with the fact that we are now five years past the panic of 1907, after which it was said on all hands that a period of years was required for the country to grow up to the capacity. The least optimistic did not name more than half a dozen years, while many spoke of three or four years. Inasmuch as we need to consider only 1913, not 1912, for its history is already written, we have a period of full five years elapsed. Productive capacity has increased during that period, of course, but it was expected to do so. It has not really increased with great rapidity, and particularly so because the industry is clearly in line to abandon some of its capacity. There are many blast furnaces, active in 1909 or 1910, which need not now operate as an accompaniment to prosperity. There can be prosperity, even though such furnaces do not have an opportunity to run. There is a not inconsiderable amount of Bessemer steel making capacity in the country which may be idle, or only partly employed, even if the industry as a whole is quite prosperous.

It is undoubtedly true that 1913 must have some favorable features beyond those which 1912 has had, in order to continue the present prosperity throughout the year, for the simple reason that 1912 has had at least two features which 1913 will not have. In the first place, stocks of finished steel in all hands were extremely low at the close of 1911, much under the normal, and of course that condition cannot prevail again

at the close of this year. In the second place, a portion of the 1912 activity was based upon extremely low prices, and if 1913 were ushered in by anything of that sort it would not be a prolongation of the present prosperity at all. No early recession to the level of last November is conceivable.

A very important element in making for tonnage is the very prosperous conditions obtaining abroad. Lately our iron and steel exports have risen to a point where they are of real tonnage importance. For three months our exports have averaged a rate of 3,400,000 gross tons a year, while in 1907 they were only 1,300,000 tons. Here is 2,000,000 tons which the growth of domestic demand does not need to take care of. Prices have been advancing in the foreign markets, and to-day are for many products higher at European market centers than prices at which deliveries are being made by our manufacturers to domestic consumers. Costs have risen abroad very materially. The present labor shortage in the United States is due largely to the fact that increased prosperity here did not set up the usual tide of immigration, and one reason it did not was that labor is better paid abroad than it was. Speaking in general terms, it must have required a very decided improvement in the rewards of labor abroad to prevent heavy emigration to the United States, for our own rates are advanced. As long as business conditions abroad remain as good as they are now, we may count, not simply on continuing to export at the rate of more than 3,000,000 tons a year, but on increasing our exports still further.

Apart from the influences of such general business conditions as we have been discussing, in tending to shape the character of 1913 in the iron and steel trade, the human element looms very large. The present pace, of mills falling farther and farther behind in deliveries, and of advancing prices at frequent intervals, even though by increments of only a dollar a ton, cannot continue indefinitely. Even assuming that such a pace will be maintained through the four remaining months of this year, what will be the psychological effect upon buyers when it ceases? In the wide open market of the old days, buyers welcomed such a condition. The wisest were glad to see periods of dullness, for then they could slip in and cover at concessions. In controlled markets, such as have frequently obtained in later years, any evidence of a recession, any cutting by individual manufacturers, has tended on the other hand to frighten buyers. Each concession offered created a disposition to wait for further and larger concessions. Should buyers some months hence be confronted with a market in which the trends are not all uniformly in the present direction, it is a question which viewpoint they will assume; and a great deal will eventually depend upon this feature.

That a market like to-day's may eventually run into a period of careful and limited buying because of the high level of prices, is a possibility of which steel manufacturers may not lose sight. Such an outcome would not be so serious as the actual cutting off of consumption which might be the second stage. Since cooperation is under the ban, the Steel Corporation is no longer found giving publicity to its market policy, whether of market conservation or otherwise. From the fact that it did not follow some of its competitors in the last $1 advance in bars, plates and structural shapes, it has been inferred that it is exerting itself, in those lines at least, to hold the situation in check. Its great size and influence put a responsibility on the Steel Corporation which it cannot escape, even in the face of a government prosecution that seeks to use against it all that it has ever done, whether good or bad. It is the one producer that has output enough really to give practical effect to any conviction it may have that the best way to lengthen the present period of prosperity in steel is to make haste slowly in recouping the earnings taken from it in the fierce competitions of the past year.

The Collection of Machine Tool Data

In *The Iron Age* of August 1 was printed an article urging measures looking to a systematic collection of engineering data concerning the metal working machine. A few letters from machine builders have been received and other machine manufacturers have been interviewed. Two general points of view have been clearly marked and they are just about what one would expect from first consideration of the subject.

The article referred to, which was contributed by Charles A. Carpenter, an engineer who has had experience in both designing and selling, suggested that some association or body collate fundamental information concerning machines and machine performance, partly for the general advantage such data would offer to machine designers and partly to insure wiser selection of machines by users. In the opinions expressed so far appears the attitude so commonly taken on questions of this sort that for a maker to divulge the results of his observations is an uncalled-for gift to competitors and to would-be machine builders, of a stock in trade accumulated after years of business. A few replies have approved of the idea, though in rather vague terms. The majority, however, are inclined to regard what they know as private.

The Iron Age has not completed its own investigation of the subject, but it is pertinent to suggest that what is sought is not so much special information in regard to a given machine as information applicable to machines as a class of manufacture. It is beside the question to say that there are so many considerations that definite data of wide application are impossible. The same may be said of the steam engine, as to steam pressures, the use of superheat, proportions and number of cylinders for the same power, piston speed, crank pin stresses, lubrication, etc. What are needed are reports of tests where the variables are reduced to a minimum number.

Tests of cutting tools in respect to feed, speed of cutting, material cut, and material doing the cutting are calculated to instill confidence in the product of the maker who works to secure such data, and they certainly do not impart inside information on the design of the machine. The more common experimentation is, the more chance of showing unexpected weak points or the reverse. There is no suggestion, moreover, of hurrying into print with the results of such work. But the fact is that too often the experimenter has no thought of publishing valuable hints which could be given without harm to himself, nor has he available any widely recognized bureau for the collation and sorting of the data, as Mr. Carpenter's article urged. Individuals and concerns have actually gained commercially by giving out their own findings. Their chief safeguard has been that while the would-be

copyists are trying to acquire the rationale of their original product, they themselves are busy with an advanced step.

There is no question that as the average machine is built, embodying the idea of the practical man, it is an evolution of the cut and try method. This means a large money loss to the industry as a whole. On the other hand we would have the designer taking the idea and producing with minimum waste effort the desired machine, because of his knowledge of the limited practical range of gear trains, of link, belt or other drives, of the desirable limits of the surface and inclination of sliding ways, of stresses which are transmitted through machine frames, of the proportions of metal required to meet them, of methods of lubrication, etc. Much if not all the information needed is applicable to the machine tool industry as a whole. That it might become available for a new concern is of less moment than its benefit to all established manufacturers. The newcomer in the field might any way prove the difficulty of keeping manufacturing secrets.

After all, it is not unlikely that technical schools will supply most of the material wanted. It is really from independent investigators that most of our knowledge of engines, boilers and materials of construction and much other engineering data have come. They do not aim at details peculiar to a specific type but rightly leave these to the maker. The specialization in metal working machinery naturally makes each such builder expert in the refinements of his own product, but the fundamentals, strangely, seem none too generally available. When they do become so, the effect upon the design of general machine parts may be more important than is now appreciated.

The Lawrence Dynamite Developments

The disclosure by a woolen mill builder, who afterward committed suicide, that he and woolen mill owners had conspired to "plant" dynamite during last winter's mill workers' strike is the almost unbelievable story which comes from Lawrence, Mass. It has invariably been alleged by strikers that they suffered from the machinations of employers who hired thugs to commit violence and thus throw odium on the striking workmen but this has usually been regarded by the public as a very weak effort to shift the burden of responsibility for acts of lawlessness. The Lawrence case supplies an apparently authenticated instance of such a "frame up" on the part of a group of employers. Dynamite was bought, placed where it could easily be found, and the strikers received the blame for it, thereby suffering unmerited condemnation for an attempted crime against society and civilization. It was a dastardly piece of work, and those concerned in it, whoever they are, should receive the extreme penalty of the law. They have betrayed the cause of employers generally, by supplying a basis on which hereafter allegations by strikers against unscrupulous or lawless acts of employers will be received with credence by a disinterested public. It is to be hoped that when the full details of this conspiracy against society shall have been laid bare it will be found to have included a very few men, who devised the scheme without the knowledge of the other Lawrence employers. It is inconceivable that the Lawrence mill owners as a body would countenance such an act of scoundrelism.

Lake Superior Mining Institute

Seventeenth Annual Meeting at Houghton, Mich.—Co-operation with the Bureau of Mines

At the seventeenth annual meeting of the Lake Superior Mining Institute, held in Houghton, Mich., and vicinity August 28-30, the following officers were elected for the coming year:

President, Pentecost Mitchell, Duluth, Minn.; Vice-Presidents for two years, F. J. Webb, Duluth, Minn., and A. D. Edwards, Atlantic, Mich.; Vice-President for one year to fill vacancy, W. P. Chinn, McKinley, Minn.; Managers, G. S. Barber, Bessemer, Mich., W. H. Johnston, Ishpeming, Mich., C. H. Baxter, Loretto, Mich.; Treasurer, E. W. Hopkins, Commonwealth, Wis.; Secretary, A. J. Yungbluth, Ishpeming, Mich.

Although the meeting was held in the copper country, the tours of inspection brought out methods of shaft and shaft-house construction, the arrangement and equipment of crushing plants, new features in hoisting, compressor and electric power service, modern repair and maintenance shop methods, sanitary dry-houses, welfare work, etc., which were of interest to the members from the Minnesota and lower Michigan ranges. The papers and discussions also turned very largely on the practices followed in iron mining.

Wednesday afternoon the members and their guests visited the Michigan smelter, the surface plant of the Champion mine, and the dry-house, shaft-house and oil storage plant at the Baltic mine. Thursday, the party was first taken to the power house and mill of the Calumet & Hecla Mining Company, on Lake Linden, and also inspected the site of the new regrinding plant, a feature of which is the fact that it will be operated wholly on electric current generated by a steam turbine set taking the exhaust from the steam stamps. Next the Ahmeek mine was visited. Here the members were chiefly interested in the use of concrete stringers to replace underground timbers and also in the centralized crushing plant. The tour concluded with an inspection of the Franklin, Jr., property, where the principal object of comment was an air-balanced hoisting engine operating a single 10-ton skip. Here the skip, in descending, compresses air in cylinders that are placed at the ends of the steam cylinders. This air passes to three large receivers, where it mingles with steam from the boilers, and the mixture is admitted to the steam cylinders of the hoist for its operation. Compression of the air also acts as a brake on the hoist. Separate parties also visited other mines and mills.

Sessions for Papers and Business

The business sessions were well attended. Wm. Connibear, Ishpeming, read a paper on the "System of Safety Inspection of the Cleveland-Cliffs Iron Company," which evoked considerable discussion, including an explanation by M. M. Duncan, agent of the company, of some facts not brought out in the paper that were subjects of questions. Benedict Crowell, of Cleveland, who was to have described "Methods of Sampling at Lake Superior Iron Mines" was prevented by illness from being present, but his paper was distributed in printed form, as was also that of Edwin N. Cory, Negaunee, on "Raising Shaft at Rolling Mill Mine, Negaunee, Mich."

E. B. Wilson, editor of Mines and Minerals, discussed "Mine Sanitation." S. R. Elliott, Negaunee, Mich., presented a paper on "Raising, Sinking and Concreting No. 3 Shaft, Negaunee Mine." O. P. Hood, Pittsburgh, gave a carefully worked out explanation, illustrated by chart diagrams, of methods evolved for balancing rock crushers, which elicited considerable interest.

Other papers were "Notes of Methods of Mining Iron Ore in the Lake Superior District," by F. W. Sperr, Houghton; "Some Applications of Concrete Underground," by H. T. Mercer, Painesdale, Mich.; "Rock House Practice" of the Quincy Mining Company and Copper Range Consolidated Company, by T. C. De Soller and H. T. Mercer, respectively; "Construction of Intakes at Mills," by Edward Koepel, Beacon Hill, Mich.; "The New Franklin Hoist," by R. H. Corbett, and others relating to the geology of the Keewenaw Peninsula which were mainly of local interest.

Following the business sessions, there were demonstrations of electrolytic and other work at the Michigan College of Mines, and an inspection of the models showing various methods of mining which have been prepared by Prof. F. W. Sperr.

Co-operation with the Bureau of Mines

Thursday evening a dinner and concert were given at the Onigaming Yacht Club's quarters, near Houghton, the feature of the occasion being an address by Dr. J. A. Holmes, director of the U. S. Bureau of Mines, which was very enthusiastically received. Dr. Holmes' visit was in response to the invitation of the Institute, with the specific object of bringing the work of the latter into closer co-operation with that of the Bureau of Mines, and a committee of the Institute has been appointed to take the matter in charge.

In his address Dr. Holmes alluded to the breaking down of barriers and the co-operation between the various Lake Superior mining interests, which has already been effected by the Institute, and mentioned some of the improvements in methods and policies brought about during the past two decades. He stated that the Bureau is endeavoring to gather all possible information concerning the conservation of life and of resources in mining and to give it out through channels where it will be the most productive of benefit to all concerned. There is no intention, he emphatically declared, of prying into the private affairs of mining companies; and the Bureau has resolutely refused to be drawn into cases in courts, a stand in which it has been sustained by the Federal Department of Justice when efforts have been made by interested parties to introduce testimony by officials or employees of the Bureau. He then went into various features of the work of the Bureau, which have already been brought quite fully before the readers of *The Iron Age*.

A. M. Gow, of the Oliver Iron Mining Company, gave strong endorsement of Dr. Holmes' remarks and dwelt at some length upon the practical benefit to be derived from the publications of the Bureau. This led to some further discussion of safety appliances and regulations, which was closed by M. M. Duncan with a graceful compliment to the methods followed in the copper country, the success of which he said the iron mining companies, under the handicap of more difficult conditions, were striving to emulate.

From the information brought out at the several sessions and on the tours of inspection, it was evident to even the most casual observer that the past year has been one of progress all along the line; and the spirit manifested throughout the meeting gives promise of at least equally good results during the coming season.

New Publications

The Special Steels: Their History, Properties, Treatment and Production. (Die Spezialstähle: Ihre Geschichte, Eigenschaften, Behandlung und Herstellung.) By G. Mars. 6½ x 10 in., VI + 517 pages; 143 illustrations. Price, bound, 17 marks. Published by Ferdinand Enke, Stuttgart, Germany.

This large book of 21 chapters is an evidence of the importance of the subject of special steels as distinct from ordinary carbon steels, and also of the complexity of the whole subject of steel. The first two chapters are short and deal with classification and history. Then come four chapters that are really introductory to the main part of the book. The first very naturally treats of metallography, for it is only by careful metallographic work that the special steels can be properly examined and rules be laid down for their correct treatment. The succeeding three chapters are respectively on the Iron-Carbon Diagram, Heat Treatment, and Forging and Cold Working.

After a chapter on Carbon Steels the special steels are taken up in order. The chapters are headed: Silicon Steels, Manganese Steels, Chrome Steels, Molybdenum Steels, Tungsten Steels, Vanadium Steels, Titanium Steels, Aluminum Steels, Steels of the Elements of Groups 1 to 8 in the Periodic Classification, Nickel Steels, and Steels of the Elements of Groups 9 to 16. The chief stress in all these chapters is laid on the properties of the various steels, and the results obtained by the many research workers in many countries are brought together. Some omissions are, of course, unavoidable, but the valuable work of Baker on Silicon Steels is not mentioned, nor that of Swinden on Molybdenum Steels. Also in the chapter on Vanadium Steels, which is rather disappointing, Kent-Smith is merely mentioned in a footnote, although his work on this subject has been most important. The last three chapters are particularly interesting. They are entitled Construction Steels, High Speed Tool Steels, and Notes on the Production of the Special Steels. The first of these takes up the ternary and quarternary steels that are used for construction purposes, the chief of which are the various modifications of nickel steel. That on the high speed steels, which comprises 44 pages, is probably the best in the book, while the last one gives several original suggestions for improvements in the manufacture of special steels. An amusing misprint may be seen on p. 389, where Taylor's well-known book is called "The Act of Butting Metals."

The volume as a whole is a very valuable addition to technical literature. It is well printed and well illustrated, the microphotographs being especially good, and is written in clear, simple, straightforward German. G. B. W.

Manual of the Iron and Steel Foundry. (Lehrbuch der Eisen und Stahl Giesserei.) By B. Osann, professor at the Königlichen Bergakademie in Clausthal. 6½ x 9½ in., XII + 497 pages. 5 plates and 526 illustrations. Price, bound, 16.50 marks. Published by Wilhelm Engelmann, Leipzig, Germany.

This book can be cordially recommended to all interested in iron or steel foundries and their products. The writer is a well-known authority and the book is a splendid example of German thoroughness. After a few introductory chapters dealing with the materials used in the foundry and with direct casting, melting furnaces are taken up, the chapters on the air furnace and the cupola being very good. The open-hearth furnace is not considered.

A chapter on the charge takes up the influence of impurities, also special additions, such as ferromanganese, ferrosilicon, etc., and the calculation of the charge. The next six chapters deal with the properties of the metal, such as the melting point, specific weight, segregation, gas separation, expansion and contraction, and the formation of the pipe. These subjects are treated exhaustively and well, the work of the American authors, Keep and West, being given due prominence. A chapter of 20 pages then takes up the methods of testing castings.

The next ten chapters deal with molding and do so very thoroughly. The one on molding machines covers over 40 pages, and in the chapter headed Examples of Molding Technique very many different kinds of molds are taken up. This section is particularly rich in clear, well-produced illustrations. The titles of these ten chapters may be given. They are: General Notes on the Making of Molds, Molding Machines, Examples of Molding Technique, Pipe Foundries, Remaining Kinds, Chilled Castings, Molding Boxes, Finishing Molds for Pouring, Drying Arrangements, and Material for Molds (molding sands, etc.). The last two chapters are very good, but it seems strange that more prominence is not given to the use of producer and blast furnace gas for drying molds and chambers. From recent German articles we have been led to suppose that these sources of heat are considerably used in German foundries. A short chapter on ladles is followed by two, on steel and malleable castings, of 33 and 36 pages respectively. Then come: Cleaning Methods, Welding, Cranes and Carrying Arrangements, Lay-out and Design, Foundry Bookkeeping, and a final chapter on Metallography.

It will be seen that the whole ground is covered, and the work is done excellently and thoroughly. The German is clear and the illustrations are so good and numerous that they constitute a very valuable part of the book. G. B. W.

Elwood, Ind., will celebrate September 13 the twentieth anniversary of the opening of the mills of the American Tin Plate Company. This company was the first in America to establish successfully the manufacture of tin plate, including the rolling of the black plate. An elaborate programme has been arranged under the auspices of the local Merchants' and Manufacturers' Club.

Pig Iron Output Growing

August Total Shows 100,000 Tons Increase

September Opens with 10 More Furnaces Active than on August 1

August brought a 100,000-ton increase in pig iron production over the make for July, or to 2,512,431 gross tons of coke iron against 2,410,889 tons, a daily average of 81,406 tons, against 77,738 tons in July, when heat and humidity were marked. There was a net gain of 10 furnaces last month, or from 247 to 257, and the daily active capacity September 1 was 82,058 tons, against 78,653 August 1, indicating that production in September will be at the highest rate for the year. Steel works furnaces produced 1,843,404 tons last month, against 1,803,205 tons in July. Merchant furnaces showed a gain of 2,000 tons a day in August, or from 19,570 tons to 21,582 tons.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from August, 1911, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons.

	Steel works.	Merchant.	Total.
August, 1911	47.120	15,030	62,150
September	49,696	16,207	65,903
October	50,351	17,460	67,811
November	48,430	18,218	66,648
December	46,885	19,027	65,912
January, 1912	47,844	18,540	66,384
February	53,482	18,960	72,442
March	58,961	18,630	77,591
April	61,024	18,157	79,181
May	62,018	19,033	81,051
June	60,799	20,559	81,358
July	59,168	19,570	77,738
August	59,464	21,582	81,046

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces in August and the four months preceding:

Monthly Pig Iron Production—Gross Tons.

	Apr. (30 days)	May. (31 days)	June. (30 days)	July. (31 days)	Aug. (31 days)
New York	152,419	177,846	176,216	167,935	167,337
New Jersey	.....	.....	2,773	5,309	5,935
Lehigh Valley	79,955	75,444	72,074	72,248	80,987
Schuylkill Valley	61,323	65,252	67,096	69,776	71,937
Lower Susquehanna and Lebanon Val.	46,102	47,336	50,034	58,032	59,852
Pittsburgh district	599,774	634,160	591,178	583,745	584,601
Shenango Valley	117,099	119,018	118,801	114,877	116,610
Western Penn.	129,223	141,385	138,354	135,876	145,321
Maryland, Virginia and Kentucky	33,744	38,005	42,569	40,313	43,962
Wheeling district	110,296	117,993	107,077	101,674	111,561
Mahoning Valley	248,173	247,401	229,159	234,248	252,342
Central and North Ohio	184,699	193,012	191,603	178,777	196,901
Hocking Valley, Hanging Rock and S. W. Ohio.	39,446	40,267	34,817	31,196	35,410
Chicago district	332,004	377,292	387,567	374,153	383,540
Mich., Minn., Mo., Wis., Col., Wash.	68,846	67,825	63,649	68,910	73,278
Alabama	151,610	150,915	141,422	147,409	156,115
Tenn., Georgia and Texas	20,723	19,431	26,356	26,411	26,742
Total	2,375,436	2,512,582	2,440,745	2,410,889	2,512,431

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.

	Pig. Total production			Spiegeleisen and ferromanganese.		
	1910.	1911.	1912.	1910.	1911.	1912.
January	1,773,201	1,128,448	1,483,153	19,538	8,360	22,622
February	1,620,539	1,185,782	1,550,995	21,396	12,821	15,950
March	1,739,212	1,518,063	1,827,792	25,591	11,784	11,538
April	1,669,898	1,434,142	1,830,717	22,304	10,657	11,104
May	1,619,283	1,310,378	1,922,557	26,529	13,641	20,518
June	1,549,112	1,281,241	1,823,958	27,680	22,611	26,685
July	1,462,689	1,316,646	1,803,205	22,924	17,067	26,522
August	1,442,572	1,460,610	1,843,404	25,756	14,579	24,225
September	1,410,221	1,490,898	.....	15,151	17,757	.....
October	1,419,624	1,560,884	.....	8,500	19,697	.....
November	1,242,804	1,452,907	.....	9,032	19,678	.....
December	1,113,174	1,453,446	.....	12,178	20,698	.....

Capacity in Blast September 1 and August 1

The table below shows the daily capacity of furnaces in blast September 1 and August 1:

Coke and Anthracite Furnaces in Blast.

Location of Furnaces.	Total number of stacks.	Sept. 1 Number in blast.	Sept. 1 Capacity per day.	Aug. 1 Number in blast.	Aug. 1 Capacity per day.
New York:					
Buffalo	17	15	5,015	15	5,150
Other New York	7	2	382	2	423
New Jersey	7	1	190	1	170
Pennsylvania:					
Lehigh Valley	22	11	2,425	11	2,437
Spiegel	2	1	90	1	90
Schuylkill Valley	16	8	2,320	8	2,190
Lower Susquehanna	7	5	1,320	4	1,010
Lebanon Valley	10	7	925	6	860
Pittsburgh District	49	42	18,433	43	18,410
Spiegel	4	4	520	4	543
Shenango Valley	20	11	3,762	11	3,675
Western Pennsylvania	27	18	4,860	16	4,510
Maryland	4	2	626	2	590
Wheeling District	14	10	3,620	9	3,280
Ohio:					
Mahoning Valley	24	21	8,050	19	7,556
Central and Northern.	24	18	6,690	16	5,850
Hocking Val., Hanging Rock & S. W. Ohio	15	8	1,142	8	1,015
Illinois and Indiana	32	28	12,255	27	11,975
Spiegel	2	2	240	2	200
Mich., Wis. and Minn.	10	7	1,385	6	1,268
Colorado, Mo. & Wash.	8	3	1,040	3	965
The South:					
Virginia	23	5	735	5	584
Kentucky	5	1	130	1	130
Alabama	46	19	5,040	19	4,920
Tennessee	20	8	863	8	852
Total	415	257	82,058	247	78,653

Among furnaces blown in in August were one Crane in the Lehigh Valley, one Steelton in the Susquehanna Valley, one Bird Coleman in the Lebanon Valley, one Shenango in the Shenango Valley, No. 2 Josephine and Rebecca in western Pennsylvania, one Crozer in Virginia, one Riverside in the Wheeling district, Brier Hill, and one Hubbard in the Mahoning Valley, Central A (Cleveland), Toledo B and Columbus No. 2 in Ohio, one South Chicago in Illinois and one Bay View in Wisconsin.

Furnaces blown out last month were Bethlehem G in the Lehigh Valley, one Isabella in Allegheny County, Princess in Virginia, one South Sharon in the Shenango Valley, and one River in Ohio.

Chart of Pig Iron Production and Prices

The fluctuations in pig iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907.—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
January	71,149	33,918	57,975	84,148	56,752	66,384
February	73,038	37,163	60,976	85,616	64,090	72,442
March	71,821	39,619	59,232	84,459	70,036	77,591
April	73,685	38,289	57,962	82,792	68,836	79,181
May	74,048	37,603	60,753	77,102	61,079	81,051
June	74,486	36,444	64,656	75,516	59,585	81,358
July	72,763	39,287	67,793	69,305	57,841	77,738
August	72,594	42,851	72,546	67,963	62,150	81,046
September	72,783	47,300	79,507	68,476	65,903	.....
October	75,386	50,554	83,856	67,520	67,811	.....
November	60,937	51,595	84,917	63,659	66,648	.....
December	39,815	56,158	85,022	57,349	65,912	.....

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
Jan.	2,205,607	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911
Feb.	2,045,068	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815
Mar.	2,226,457	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318
Apr.	2,216,558	1,149,602	1,738,877	2,483,763	2,064,086	2,375,436
May	2,295,505	1,165,688	1,883,330	2,390,180	1,893,456	2,512,582
June	2,234,575	1,092,131	1,930,866	2,265,478	1,787,566	2,440,745
July	2,255,660	1,218,129	2,103,431	2,148,442	1,793,068	2,410,889
Aug.	2,250,410	1,359,831	2,248,930	2,106,847	1,926,637	2,512,431
Sept.	2,183,487	1,418,998	2,385,206	2,056,275	1,977,102	.....
Oct.	2,336,972	1,567,198	2,599,541	2,093,121	2,102,147	.....
Nov.	1,828,125	1,577,854	2,547,508	1,909,780	1,999,433	.....
Dec.	1,234,279	1,740,912	2,635,680	1,777,817	2,043,270	.....

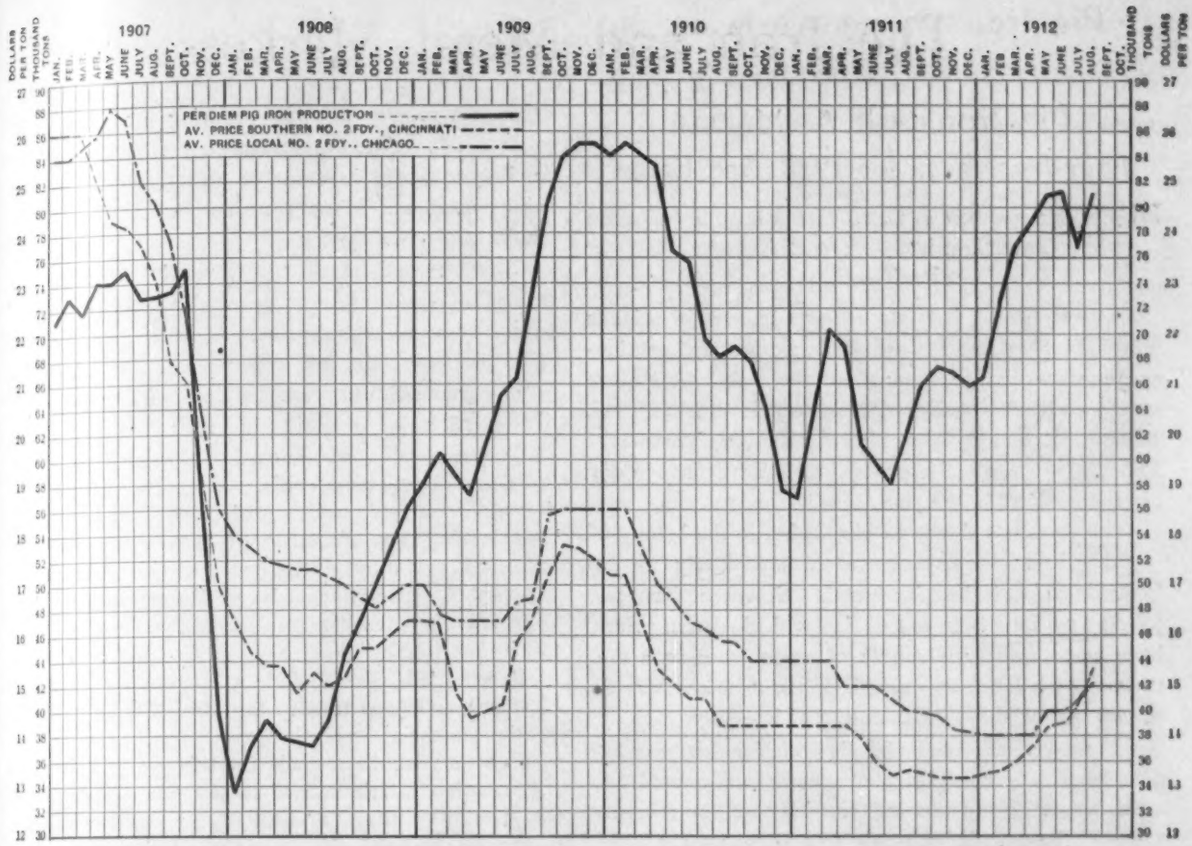

Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to September 1, 1912; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace.

Baltimore Business and Industrial Notes

Considerable interest has recently attended the chartering of four steamships to load practically full cargoes of agricultural machinery from this port for delivery at points on the Mediterranean and the Black Sea. Increased facilities offered by the Western Maryland Railroad are said to have been instrumental in diverting these shipments from other ports.

The Chesapeake Iron Works has had quite an active month, even though most orders for structural and ornamental iron work have been small. A contract for the steel work for the Citizens' National Bank, Raleigh, N. C., has been entered, as has also that for a warehouse in Waynesboro, Pa. Inquiry for moderate sized buildings is good and more active conditions are anticipated in the near future.

The Thomas C. Bashor Company reports that while the August demand for boilers and tanks was light, the plant continues actively engaged on previous orders. Considerable special work for fisheries plants has been ordered, including a good quantity of equipment for the Douglass Fisheries Company, Reedville, Va., and the Norfolk Fisheries Company, Goodwin's Island, Va.

The Aumen Machinery Company has entered an order for the entire machine tool equipment for the new plant of the Bigelow Brush Company and an order for a complete evaporating and condensing plant for export to Mexico. Considerable pump business has also been secured. This company reports a very fair month's business in both metal and wood working machinery as well as special equipment.

Detrich Brothers are busy in all departments. Contracts closed recently for fabricated structural work, while not large, have been numerous. Among them was the steel work for No. 6 school building, for which the B. F. Bennett Building Company has the general contract. Considerable steel work will also be furnished for additions to the Johns Hopkins Hospital. A large amount of apartment house structural work is being estimated on.

Riggs, Distler & Stringer, engineers, have completed the installation of the power, heating and mechanical plant in the Maryland Casualty Building addition. They have taken several good contracts for vacuum cleaning and steam heating work. While business in power equipment has been light, considerable estimate work is under way.

The Wallace Stebbins & Son Company reports a very fair demand for general shop supplies. New business in engines and boilers has been light, although several contracts for small heating plants have been entered. The company's shop is extremely busy on general repair work.

The Baltimore & Ohio Railroad has under construction improvements which, when completed, will materially better conditions in South Baltimore. A new bridge has been erected over its tracks at Hamburg street, and bridges are to be erected at Cross, Stockholm and Lee streets. The company has under consideration extensive trackage improvement in and around the city.

The Vulcan Fire Brick Company, Wilmont, Va., of which L. N. Rancke is general manager, has moved its local office from the Knickerbocker Building to 218 East York street, Baltimore. To its already extensive line of fire brick it has added special and fancy building brick.

The Board of Awards of the city is stated to have given to the Singer-Pentz Company the contract for a heating plant to be installed in the hall of the Produce Market, Market Place, from plans by the department of the inspector of buildings.

Reports are current that the old Register Foundry, Holliday and Saratoga streets, burned some time ago, is to be replaced by a modern factory building, plans for which are to be ready early in September. The Holliday Real Estate Company is understood to be the present owner of the property.

Stockholders of the Duplex Metals Company, Chester, Pa., manufacturer of copper clad wire products, will hold a meeting September 10 to consider a proposed increase of $1,500,000 in preferred stock. The present capital is made up of $3,000,000 common and $500,000 preferred stock. It is the intention to practically double the size of the plant.

The Iron and Metal Markets

Pig Iron Still Advancing

Foundry Needs for 1912 Are Large

Higher Prices for Billets, Tin Plate, Iron Pipe and Shafting—Record August Specifications

Activity in pig iron at further advances in price is still the outstanding feature of the market, and cautionary expressions are coming out there that heretofore have only been considered necessary in finished steel. Blast furnace companies, after a profit famine of over four years, are not disposed as yet, however, to see any cause for alarm in the pace.

The week has shown no slackening in the buying of foundry iron; in some markets, particularly in the Central West, it has increased. Northern furnaces, which have long been out of line with Southern prices, have made further advances of 25 to 50 cents a ton, generally the latter figure and for the most part are on a level nearly $1 higher than that of late July.

Foundry requirements of pig iron for this year are now seen to be much greater than was estimated two months ago. Many furnaces are fully sold up for 1912 and still the unsatisfied needs of melters appear large. Much of the heavy buying for next year is plainly inspired by conditions which point to further price advances.

Our blast furnace statistics of September 1 show that while production of pig iron was 100,000 tons more last month than in July, it was then only equal to the May output and fell below that of June. The total was 2,512,431 tons, or 81,046 tons a day, against 2,410,889 tons, or 77,738 tons a day in July, when high heat and humidity were a handicap in all districts. Merchant furnaces increased their production to 21,582 tons a day last month, or by 2000 tons a day, and steel works furnaces increased to 59,464 tons or by 1300 tons a day.

The industry entered September with 257 furnaces active, with a daily capacity of 82,058 tons, as against 247 furnaces with a capacity of 78,653 tons a day on August 1. September output thus promises to be at the highest rate of the year.

Other furnaces are preparing to blow in this month, but with a number of coke producers now shipping only 80 per cent. of what contracts call for, it is evident that pig iron production will expand but slowly. Efforts to increase coke supply have met with little success.

Bessemer, basic and low phosphorus pig irons have advanced along with foundry grades. Bessemer for this year has sold at $15 at Valley furnace and basic at $14.25, while for 1913 sellers are asking 50 cents higher.

The scarcity in billets and sheet bars for this year is more pronounced and in the Pittsburgh district prices are up to 50 cents a ton. The Steel Corporation has bought 10,000 tons more of Eastern billets.

August specifications poured in upon steel works and rolling mills at a rate never before known in that month. In some lines consumers are more clamorous for prompt material, offering premiums of $1 to $4 a ton. These premiums may pave the way for further advances in contract prices, but apart from rails the amount of 1913 business put through is not yet an important factor.

In sheets and tin plate particularly, consumers are trying to close for next year. Two tin plate companies advanced their price this week from $3.50 to $3.60 per base box, but applicable to 1912 deliveries only. Manufacturers are holding off forward business as all look for a still higher level.

The expansion of demand for wrought pipe and tubes has been remarkable. With the largest producers last month's orders made a new August record. One leading manufacturer of iron pipe raised its prices $2 a ton about two weeks ago. Other producers this week announced a similar advance effective September 3. Another advance of the week was $2 a ton in shafting.

Recent rail sales include 5000 tons to the Great Northern and 9000 tons to the Pere Marquette, made by the Cambria Steel Company. In the east a sale of 6000 tons has been made for this year's delivery.

Attention is still turned to the lake situation and the possibility that the heavy grain movement may limit ore shipments. The prospect of higher ore prices in 1913 is already entering into the calculations of furnace companies that are selling to the middle of next year and are quite sure to need new ore before July 1.

Official figures published this week show that the country's production of steel ingots and castings in the first half of 1912 was 14,373,701 gross tons—a new record, due to the phenomenal consumption of steel this year at the low prices. This is 300,000 tons more than the pig iron production in the same period and thus for the second time (first in the statistics of 1911) steel rather than pig iron becomes the measure of the industry.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics.*

At date, one week, one month and one year previous.

	Sept. 4, 1912.	Aug. 28, 1912.	Aug. 7, 1912.	Sept. 6, 1911.
Pig Iron, Per Gross Ton:				
Foundry No. 2, standard, Philadelphia	**$16.25**	$16.00	$15.75	$15.00
Foundry No. 2, Valley furnace	**14.25**	14.00	13.50	13.50
Foundry No. 2, Southern, Cincinnati	**15.50**	15.25	15.00	13.50
Foundry No. 2, Birmingham, Ala.	**12.25**	12.00	11.75	10.25
Foundry No. 2, at furnace, Chicago*	15.50	15.50	15.00	14.50
Basic, delivered, eastern Pa.	16.50	16.50	15.75	14.75
Basic, Valley furnace	**14.25**	14.00	13.75	13.00
Bessemer, Pittsburgh	**15.90**	15.65	15.40	15.90
Malleable Bessemer, Chicago	15.50	15.50	14.50	14.50
Gray forge, Pittsburgh	**14.65**	14.40	14.15	13.90
Lake Superior charcoal, Chicago	16.25	16.25	16.25	16.50
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh	**23.00**	22.50	21.50	21.00
Open hearth billets, Pittsburgh	**23.50**	23.00	22.00	21.00
Forging billets, Pittsburgh	29.00	29.00	28.00	26.00
Open hearth billets, Philadelphia	25.40	25.40	24.40	23.40
Wire rods, Pittsburgh	27.00	27.00	25.50	27.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	**16.50**	16.25	16.00	14.00
Iron rails, Philadelphia	16.50	16.50	16.50	17.00
Car wheels, Chicago	14.00	14.00	13.50	13.00
Car wheels, Philadelphia	14.00	14.00	14.00	13.00
Heavy steel scrap, Pittsburgh	13.75	13.75	13.50	13.00
Heavy steel scrap, Chicago	12.25	12.25	11.75	10.50
Heavy steel scrap, Philadelphia	14.50	14.50	13.50	13.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel, Per Pound to Largest Buyers:	Sept. 4, 1912. Cents.	Aug. 28, 1912. Cents.	Aug. 7, 1912. Cents.	Sept. 6, 1911. Cents.
Bessemer rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.40	1.40	1.32½	1.27½
Iron bars, Pittsburgh	1.40	1.40	1.40	1.25
Iron bars, Chicago	1.45	1.40	1.40	1.20
Steel bars, Pittsburgh	1.30	1.30	1.30	1.20
Steel bars, tidewater, New York	1.46	1.46	1.46	1.36
Tank plates, Pittsburgh	1.40	1.35	1.35	1.30
Tank plates, tidewater, New York	1.56	1.56	1.51	1.46
Beams, Pittsburgh	1.35	1.35	1.35	1.35
Beams, tidewater, New York	1.56	1.56	1.51	1.51
Angles, Pittsburgh	1.35	1.35	1.35	1.35
Angles, tidewater, New York	1.56	1.56	1.51	1.51
Skelp, grooved steel, Pittsburgh	1.25	1.25	1.25	1.20
Skelp, sheared steel, Pittsburgh	1.30	1.30	1.30	1.30
Sheets, Nails and Wire, Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.05	2.05	2.00	1.95
Wire nails, Pittsburgh	1.70	1.70	1.65	1.65
Cut nails, Pittsburgh	1.60	1.60	1.55	1.60
Fence wire, ann'led, 0 to 9, Pgh.	1.50	1.50	1.45	1.50
Barb wire, galv., Pittsburgh	2.00	2.00	1.95	2.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt shipment	$2.15	$2.25	$2.15	$1.50
Furnace coke, future delivery	2.25	2.25	2.25	1.60
Foundry coke, prompt shipment	2.40	2.40	2.40	1.85
Foundry coke, future delivery	2.50	2.50	2.50	2.10
Metals, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	17.75	17.75	17.75	12.75
Electrolytic copper, New York	17.62½	17.65	17.62½	12.50
Spelter, St. Louis	7.20	7.05	7.10	5.80
Spelter, New York	7.35	7.20	7.25	6.00
Lead, St. Louis	4.72½	4.57½	4.35	4.42½
Lead, New York	4.85	4.65	4.50	4.50
Tin, New York	47.20	46.25	45.12½	41.25
Antimony, Hallett, New York	7.87½	7.87½	7.87½	7.75
Tin plate, 100-lb. box, New York	$3.74	$3.74	$3.74	$3.94

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.40c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 3-16 in., take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inc.	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inc.	.50
Cutting to lengths or diameters under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $27. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.50; galvanized, $1.80. Galvanized barb wire, to jobbers, $2; painted, $1.70. Wire nails to jobbers, $1.70.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.65	$1.70	$1.75	$1.80	$1.90	$2.00	$2.10	$2.20
Galvanized	1.95	2.00	2.05	2.10	2.20	2.30	2.70	2.80

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. and over, and zees, 3 in. and over, 1.35c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in.	1.40 to 1.45
H-beams over 18 in.	1.40 to 1.45
Angles over 6 in.	1.40 to 1.45
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card Sept. 1, 1909	1.40 to 1.45
Tees, 3 in. and up	1.40 to 1.45
Angles, channels and tees, under 3 in. plus full extras as per steel bar card Sept. 1, 1909	1.40 to 1.45
Deck beams and bulb angles	1.65 to 1.70
Hand rail tees	2.10 to 2.25
Checkered, trough and corrugated floor plates	2.25 to 2.50

Extras for Cutting to Length.

	Cents per lb.
Under 3 ft., to 3 ft. inclusive	.25
Under 2 ft., to 1 ft. inclusive	.50
Under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.45
Nos. 9 and 10	1.50
Nos. 11 and 12	1.55
Nos. 13 and 14	1.60
Nos. 15 and 16	1.70

Box Annealed Sheets, Cold Rolled.

Nos. 10 to 12	1.70 to 1.75
Nos. 13 and 14	1.75 to 1.80
Nos. 15 and 16	1.80 to 1.85
Nos. 17 to 21	1.85 to 1.90
Nos. 22, 23 and 24	1.90 to 1.95
Nos. 25 and 26	1.95 to 2.00
No. 27	2.00 to 2.05
No. 28	2.05 to 2.10
No. 29	2.10 to 2.15
No. 30	2.20 to 2.25

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	2.15 to 2.20
Nos. 12, 13 and 14	2.25 to 2.30
Nos. 15 and 16	2.40 to 2.45
Nos. 17 to 21	2.55 to 2.60
Nos. 22, 23 and 24	2.65 to 2.70
Nos. 25 and 26	2.85 to 2.90
No. 27	3.00 to 3.05
No. 28	3.15 to 3.20
No. 29	3.25 to 3.30
No. 30	3.45 to 3.50

All above rates on sheets are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount in 10 days from date of invoice, as also are the following:

Corrugated Roofing Sheets by Weight.

Effective April 18, 1912, the rates for painted and formed roofing sheets, per 100 lb., are based on the following extras for painting and forming over prices for corresponding gauges in black and galvanized sheets:

	Gauges, cents per 100 lb.			
Painting.	29	25 to 28	19 to 24	12 to 18
Regular or oiling	...	0.15	0.10	0.05
Graphite, regular	...	0.25	0.15	0.10
Forming.				
2, 2½, 3 and 5 in. corrugated	0.05	0.05	0.05	0.05
2 V-crimped, without sticks	0.05	0.05	0.05	...
⅜ to 1¼ in. corrugated	0.10	0.10	0.10	...
3 V-crimped, without sticks	0.10	0.10	0.10	...
Pressed standard seam, with cleats	...	0.15	0.15	...
Plain roll roofing, with or without cleats	0.15	0.15	0.15	...
Plain brick siding	...	0.20	...	...
3-15-in. crimped	0.20	0.20	0.20	...
Weatherboard siding	...	0.25	0.25	...
Beaded ceiling	...	0.25	0.25	...
Rock, face brick and stone siding	...	0.25	0.25	...
Roll and cap roofing, with caps and cleats	0.25	0.25	...	...
Roofing valley, 12 in. and wider	...	0.25	0.25	...
Ridge roll and flashing (plain or corrugated)	...	0.65	0.65	0.65

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

Steel.		*Standard Charcoal Iron.*	
1¼ to 2¼ in.	63	1½ in.	46
2½ in.	65½	1¾ to 2¼ in.	48
2¾ to 3¼ in.	70½	2½ in.	53
3½ to 4 in.	73	2¾ to 3¼ in.	55½
5 to 6 in.	65½	3½ to 5 in.	58
7 to 13 in.	63		

Locomotive and steamship special grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Wrought Pipe.—The following are the jobbers carload discounts (card weight) on the Pittsburgh basing card on steel pipe, in effect from July 24, 1912; iron pipe from September 3, 1912, one point greater being allowed on merchant weight.

Butt Weld.

	Steel		Iron	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ in.	72	52	..	..
⅜ in.	73	63	66	50
½ in.	76	66	69	56
¾ to 1¼ in.	79	71	72	61
2 to 3 in.	80	73	73	62

Lap Weld.

1½ in.	..	..	67	56
2 in.	77	70	69	60
2½ to 4 in.	79	72	71	63
4½ to 6 in.	78	70	70	62
7 to 12 in.	76	66	68	55
13 to 15 in.	53	..	44	..

Plugged and Reamed.

1 to 1½ in., butt weld	77	69	70	59
2 to 3 in., butt weld	78	71	71	60
2 in., lap weld	75	68	67	58
2½ to 4 in., lap weld	77	70	69	61

Butt Weld, extra strong, plain ends, card weight.

⅛, ¼, ⅜ in.	68	58	63	52
½ in.	73	67	67	60
¾ to 1½ in.	77	71	71	62
2 to 3 in.	78	72	72	63

Lap Weld, double extra strong, plain ends, card weight.

1½ in.	..	..	61	53
2 in.	74	68	66	60
2½ to 4 in.	76	70	70	63
4½ to 6 in.	75	69	69	62
7 to 8 in.	68	58	63	53
9 to 12 in.	63	53	58	47

Butt Weld, double extra strong, plain ends, card weight.

½ in.	63	57	57	49
¾ to 1½ in.	66	60	60	52
2 to 2½ in.	68	62	62	54

Lap Weld, double extra strong, plain ends, card weight.

2 in.	64	58	55	49
2½ to 4 in.	66	60	60	54
4½ to 6 in.	65	59	59	53
7 to 8 in.	58	48	52	42

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Pittsburgh

PITTSBURGH, PA., September 4, 1912.

Steel companies report specifications pouring in at an unprecedented rate. Operations are keyed up to the highest point possible; shipments are being made as fast as the products can be turned out, and yet customers are far from being satisfied. August is usually a slack month in the steel business, but this year it was a record breaker in many respects. The situation is assuming more and more the aspect of a runaway market, which the mills are trying to avoid. Consumers are clamoring for prompt material and are willing to pay premiums of $1 to $4 a ton to get it. Shafting has been advanced $2 a ton, standard sizes of railroad spikes 10c. a keg, light rails will go up September 5 and an advance of at least 10c. per box by some of the tin plate mills is looked for this week. On nearly all lines of finished iron and steel the leading mills are practically sold up for the rest of this year, and consumers are now trying to place contracts for next year, especially for sheets and tin plate, but with little success. The whole market seems to be stronger, pig iron and steel having tightened up still more in the past week. The scrap market is fairly active, with dealers indifferent about selling. Coke is rather quiet.

Pig Iron.—The supply now seems limited, with the advantage decidedly in favor of the furnaces. Consumers are out with inquiries for next year, but the furnaces are indifferent about selling. The market on Bessemer has advanced squarely to $15 for the remainder of this year, and furnaces are asking $15.50 for first quarter and first half of next year. Basic iron has sold for delivery in first quarter at $14.50, Valley furnace, and is firm at $14.25 over the remainder of this year. There is a good deal of inquiry for Bessemer, basic and foundry iron with the tendency in prices decidedly upward. We quote: Standard Bessemer, $15 for the remainder of this year and $15.50 for first quarter and first half of next year; malleable Bessemer, $14 to $14.25; basic, $14.25 for the remainder of this year and $14.50 for first quarter; No. 2 foundry, $14.25 for prompt and $14.50 for first quarter, and gray forge $13.75 for this year and $14 for first quarter, all at Valley furnace, the freight rate to Pittsburgh being 90 cents a ton.

Steel Billets and Sheet Bars.—Last Thursday the Carnegie Steel Company bought 10,000 tons of open-hearth billets from the Alan Wood Iron & Steel Company, Conshohocken, Pa. Most of this will be shipped to Pencoyd, Pa., and the remainder will be used against commitments of the Carnegie Company for steel in the East. In August the Carnegie Company's billet and rail sales bureau sent actual orders to the mills for rolling for over 350,000 tons of rails, billets, sheet bars and track supplies—one of the heaviest month's business ever handled by this department. There is a famine in the supply of open-hearth steel and as high as $25 at mill has been quoted by one seller on a legitimate inquiry for sheet bars. There is a limited amount of open hearth steel in the hands of dealers for which they are asking heavy premiums. Sales made in the past week include 500 tons of open hearth sheet bars at $23; 1000 tons at $23.25, and 1000 tons at $24, the latter at Youngstown mill. A local open hearth steel maker has sold 5000 tons of sheet bars for delivery over the remainder of this year to a tin plate interest and is now out of the market as a seller of this product. In this condition it is very difficult to quote the market accurately, but asking prices are about as follows: Bessemer billets, $23 to $23.50; Bessemer sheet bars, $23 to $24; open hearth billets, $23.50 to $24, and open hearth sheet bars, $24 to $24.50, all f.o.b. Pittsburgh or Youngstown mills. Axle billets are firm at $28 to $29 and forging billets for general purposes are $29 to $30, f.o.b. cars at mill, Pittsburgh.

Ferroalloys.—There is a scarcity of both German and English ferromanganese and the recently established price of $53.50, Baltimore, for 80 per cent. English is being firmly held. Most consumers thought they were covered for the remainder of this year, but in some cases are not getting promised deliveries, and a leading local producer has been helping some of them out by loaning them ferromanganese until their delayed shipments arrive. Sales of carloads of prompt ferromanganese are being made at $54 to $55, Baltimore. A sale is also reported of 500 tons of English 80 per cent. for next year at $53.50, Baltimore. The rate for delivery in the Pittsburgh district is $1.95 a ton. We note sales of carload lots of 50 per cent. ferrosilicon at the full price of $72.50, delivered. We quote 50 per cent. ferrosilicon in lots up to 100 tons at $72.50; over 100 tons to 600 tons, $71.50, and over 600 tons, $70.50, Pittsburgh. The lower grades are ruling at $20 for 10 per cent., $21 for 11 per cent. and $22 for 12 per cent., f.o.b. cars at Ashland, Ky., or Jackson, Ohio. On ferrotitanium we quote 8c. per lb. for carload lots, 10c. per lb. in 2000-lb. lots and over and 12½c. per lb. in lots up to 2000 lb.

Wire Rods.—The greater activity in the demand for wire products has stimulated new inquiries and specifications for wire rods. Prices are firm. We quote Bessemer, open hearth and chain rods at $27, Pittsburgh.

Muck Bar.—There is a good deal of new inquiry, but consumers are having trouble to find makers that will sell. Local mills that roll muck bar are having trouble in getting puddlers and are disposed to hold their bar for their own needs. We quote best grades of muck bar, made from all pig iron, at $30.50 to $31 delivered at buyers' mill, Pittsburgh district.

Skelp.—New inquiry is fairly active, but most consumers placed contracts some time ago. There is a scarcity of grooved and sheared iron skelp, and prices are strong. A sale of 1500 to 2000 tons of sheared iron plates is reported at about 1.80c., Pittsburgh. We quote steel skelp at 1.25c. to 1.30c.; sheared steel skelp at 1.30c. to 1.35c.; grooved iron skelp, 1.70c. to 1.75c., and sheared iron skelp, 1.75c. to 1.80c., delivered at buyer's mill in the Pittsburgh district.

Steel Rails.—The Cambria Steel Company has received an order from the Great Northern Railroad for 5000 tons of standard sections and a contract from the Pere Marquette for 9000 tons for 1913 delivery. The Carnegie Steel Company is receiving very liberal specifications against contracts for steel rails placed some time ago, but as yet has not taken any new business for next year. The company is receiving good orders for both standard sections and light rails for export shipment. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Effective September 5, light rails will be advanced to the following prices: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and

20 lb., 1.30c.; 12 and 14 lb., 1.35c. and 8 and 10 lb., 1.40c., all in carload lots f.o.b. Pittsburgh.

Car Wheels and Axles.—The Carnegie Steel Company has taken a contract for 1000 Schoen steel wheels for the Interborough Rapid Transit Company, New York City, and the same number for the Transit Development Company, Brooklyn. The new demand for cast iron and steel car wheels for freight and passenger service continues very heavy. The Schoen works of the Carnegie Company, where the Schoen steel car wheel is made, is practically sold up over the next six months. We quote 33-in. solid rolled steel wheels for freight service at $14.50 to $15 per wheel, and 36-in. solid rolled steel wheels for passenger train service at $18 to $18.50 per wheel. The new demand for axles is heavy and we quote forged steel freight car axles at 1.50c. to 1.55c. base, per lb.

Structural Material.—New inquiries are active, but local fabricating interests are so well filled up that they are rather indifferent about quoting for delivery within 60 to 90 days. The McClintic-Marshall Construction Company has taken 1000 tons of steel for a new warehouse to be built by William Steele & Sons, Philadelphia, about 250 tons for extensions to buildings for the Wheeling Mold & Foundry Company, 150 tons for a railroad bridge for the Pittsburgh & Lake Erie at Youngstown, Ohio, and about 600 tons for extensions to mill buildings for the Pittsburgh Steel Company, Monessen, Pa. The John Eichleay, Jr., Company has taken about 450 tons for the new Olympic Theatre in this city. The American Bridge Company has taken about 2500 tons of bridge work for Western railroads. The Jones & Laughlin Steel Company is still quoting 1.40c. minimum on shapes but the minimum price of the Carnegie Steel Company remains 1.35c. We quote beams and channels up to 15-in. at 1.35c. to 1.40c., Pittsburgh.

Plates.—The Carroll-Porter Boiler & Tank Company of this city is expected to get the contract for the extension to the Akron, Ohio, waterworks, including the digging of the ditch, supplying the valves and all other equipment. The job will require about 3000 tons of plates, but there may be some litigation before the contract is finally placed. Nothing has been heard of the reported large car inquiries to come from the Pennsylvania, Baltimore & Ohio and other leading systems. Local plate mills are practically sold up for the remainder of this year, and premiums of $2 to $3 a ton are being paid for plates for prompt shipment. Some mills are reported to have sold plates for delivery within three or four weeks at as high as 1.50c. at mill. Nearly all the leading plate mills are holding plates firm at 1.40c. minimum. While the Carnegie Steel Company is still naming 1.35c., it cannot promise deliveries under four months or longer from date of the order.

Iron and Steel Bars.—The new demand for iron and steel bars since early in the year has been the heaviest ever known in the history of the bar business, with the result that for months the mills have been sold up for periods ranging from six weeks to three months, and are now so crowded with orders and are sold up so far ahead that they can readily obtain premiums of $1 to $2 a ton over regular prices for reasonably prompt shipment. There is no trouble whatever in getting 1.40c. at mills for steel bars where the mill can promise shipments in two or three weeks from date of contract. We quote merchant steel bars at 1.30c. to 1.35c. on new orders and common iron bars at 1.40c. to 1.45c., f.o.b. at mill, Pittsburgh.

Sheets.—Shipments of sheets and tin plates by the American Sheet & Tin Plate Company in August were considerably heavier than in any previous month in its history, and it expects to make fully as large shipments in September. All the sheet companies are making every effort to make as large shipments as possible in view of the expected shortage in cars. This is already being felt, the American Sheet & Tin Plate Company being short now from 35 to 40 cars per day. The new demand for sheets is heavy and specifications continue to come in at an unprecedented rate. In view of the higher cost of spelter an advance in the prices of galvanized sheets is looked for in the near future. While the sheet mills are running to practically full capacity, they are still embarrassed to some extent by the shortage in supply of sheet bars. None of the sheet mills is selling at present into next year at to-day's prices but are holding off, knowing that prices of sheet bars will be higher in the last quarter. Prices are firm on the basis of 1.50c. for No. 10 blue annealed, 2.05c. for No. 28 black and 3.15c. for No. 28 galvanized in carload lots, f.o.b. mill, jobbers charging the usual advances for small lots from store.

Tin Plate.—The report is current that the American Sheet & Tin Plate Company has advanced the price of tin plate 10c. per base box. This is incorrect, but it is expected that three or four of the other tin plate makers will shortly advance prices at least 10c., and if this is done it is likely that the leading interest will follow. Specifications continue very heavy, and the mills are getting further back in deliveries. They are still being importuned to take business at present prices for first half of 1913, but so far the only sale has been a fairly large lot taken by an outside mill at not above $3.50. The mills are not disposed to sell for next year until they know what tin bars and pig tin will cost for the last quarter. The new demand for terne plate is heavy. All makers are operating their hot mills as full as possible with the present shortage in supply of labor and steel. A good many new orders for tin plate have recently been placed by consumers who find they did not buy enough earlier in the year. We quote tin plate at $3.50 per box for 14 x 20 coke plates, f.o.b. Pittsburgh, for this year's delivery.

Bolts and Rivets.—Makers report that new demand seems to be getting heavier instead of letting up; specifications continue to come in very freely and deliveries are getting worse. Not in five years have the bolt and rivet makers had as much actual business on their books as at present. Some report that they are sold up for all of this year and are not entering any new orders for delivery inside of four months from date of contract. Prices are very firm but unchanged. We quote button head structural rivets at $1.90 per 100 lb. base, and cone head boiler rivets at $2 in carloads only, an advance of 10c. to 15c. being charged for smaller lots. New discounts on bolts are as follows: Coach and lag screws, 80 and 12½ per cent. off; small carriage bolts, cut threads, 75, 10 and 7½ per cent. off; small carriage bolts, rolled threads, 75, 10, 10 and 2½ per cent. off; large carriage bolts, 70, 10 and 5 per cent. off; small machine bolts, rolled threads, 75, 10, 10 and 7½ per cent. off; small machine bolts, cut threads, 75, 10, 10 and 2½ per cent. off; large machine bolts, 70, 10, and 10 per cent. off; square hot pressed nuts, blank and tapped, $6 off, and hexagon nuts, $6.70 off. These prices are in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works.

Hoops and Bands.—New orders continue quite heavy and specifications against contracts continue to come in very freely. One or two makers of steel bands are holding at 1.35c. minimum. All the makers are behind in deliveries, running four to eight weeks or longer. We quote steel bands at 1.30c. to 1.35c., with extras as per the steel bar card, and hoops at 1.40c. to 1.45c., f.o.b. Pittsburgh.

Shafting.—Effective September 2, prices of shafting were advanced two points, or $2 a ton, and we now quote cold-rolled shafting at 62 per cent. off in carloads and 57 per cent. off in less than carloads, delivered in base territory. The new demand is very heavy and there is a shortage in supply. Makers state that present prices of steel warrant a higher market on shafting and another advance to about 60 per cent. off in carload lots will be made in the near future. All are back in deliveries, having all the business they can take care of for the next three or four months at least.

Spelter.—The market has shown a sharp advance and prime grades of Western are now quoted at 7.15c. to 7.20c., East St. Louis, equal to 7.27½c. and 7.32½c., Pittsburgh. Still higher prices are predicted, as the demand is heavy and the supply seems to be limited.

Railroad Spikes.—Effective August 29, makers of railroad spikes advanced the large sizes to the same price charged for small railroad and boat spikes, and we now quote railroad spikes in base sizes, 5½ x 9/16 in., also small railroad and boat spikes, at $1.75 per 100 lb. f.o.b. Pittsburgh, and the market is very strong at this price. Railroads are specifying freely against contracts, and the spike makers are filled up over the next two or three months. One leading maker is not accepting new orders for delivery before December.

Wire Products.—The new demand for wire and wire nails is fairly active, but specifications against contracts made prior to the recent advance in prices are reported by the mills as coming in very freely. It is stated that only a small amount of business in wire nails is still on the books at the $1.60 price, nearly all unfilled orders being at $1.65 and $1.70. The new demand for barb and fence wire is quiet, but is expected to get active this month, as the fall trade is predicted to open up early in October, and jobbers are accumulating stocks to meet an expected heavy demand. We quote wire nails at $1.70 per keg; cut nails, $1.60; galvanized barb

wire, per 100 lb., $2; painted, $1.70; annealed fence wire, $1.50, and galvanized fence wire, $1.80, f.o.b. Pittsburgh, usual terms, freight added to point of shipment.

Merchant Steel.—Mills report that the new demand is active, and specifications against contracts still coming in very freely. All the mills are six to ten weeks or longer back in shipments, and the situation in this respect seems to be getting worse. Prices are strong and we quote: Iron finished tire, 1½ x ⅜ in. and larger, 1.30c., base; under ⅜ in., 1.40c.; planished tire, 1.50c.; channel tire, ¾, ⅞ and 1 in., 1.80c.; 1⅛ in. and larger, 1.65c.; toe calk, 1.85c., base; flat sleigh shoe, 1.35c.; concave and convex, 1.70c.; cutter shoes, tapered or bent, 2.30c.; spring steel, 1.90c.; machinery steel, smooth finish, 1.70c., all f.o.b. cars, Pittsburgh.

Merchant Pipe.—The East Ohio Gas Company, Cleveland, Ohio, a Standard Oil Company interest, is in the market for about 140 miles of 20-in. steel pipe to be used in laying a line from the West Virginia natural gas fields to Cleveland. There is some trouble over the city of Cleveland granting a franchise, and the line may not be laid for some little time. The new demand and specifications for merchant pipe continue very heavy and the leading mills are practically sold up over the remainder of this year. Several pipe makers state they have already sold as much pipe so far this year as they sold in all of last year, and deliveries seem to be getting worse. The discounts on iron pipe were shortened one point, September 3, an advance of $2 per ton, and it is the general belief that there will be an advance of one or two points in prices of steel pipe within a short time, owing to the very heavy demand and the higher prices of plates.

Boiler Tubes.—The new demand for both locomotive and merchant tubes is very heavy, and specifications against contracts are pouring into the mills at a lively rate. On seamless steel tubing, several leading makers are sold up over the next three or four months, and the whole market is very strong. Discounts on both iron and steel tubes are being firmly held, and an advance in prices is looked for in the near future.

Iron and Steel Scrap.—The leading consumers seem to be pretty well covered, and only a moderate amount of material is being sold by the dealers. There has been an embargo on scrap for over two months at the works of the Pittsburgh Steel Company at Monessen, Pa., and there is also an embargo on borings and turnings at the plant of the West Penn Steel Company at Brackenridge, Pa. There is a fairly active demand for heavy steel scrap, and sales of 1500 to 2000 tons have been made at $13.75 delivered. Several dealers claim they could readily sell heavy steel scrap at $14 if they cared to do so. The market on borings and turnings is rather quiet and the top price obtainable for borings is $9.75 delivered. We note sales of 400 to 500 tons of turnings at $10.75 delivered and 300 to 400 tons of borings at $9.75 delivered. There is more low phosphorus melting stock moving and prices are firm; we note a sale of 400 tons at $16 and a sale of 500 tons by an open hearth steel plant at $16 at shipping point, equal to about $16.35 delivered. Bids are going in to-day on the scrap lists of the Erie and the Pennsylvania railroads. Dealers quote as follows, per gross ton:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	$13.75 to $14.00
No. 1 foundry cast	13.25 to 13.50
No. 2 foundry cast	12.00 to 12.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	12.25 to 12.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	15.00 to 15.25
No. 1 railroad malleable stock	13.00 to 13.25
Grate bars	9.75 to 10.00
Low phosphorus melting stock	16.25 to 16.35
Iron car axles	24.50 to 25.00
Steel car axles	16.50 to 16.75
Locomotive axles	25.00 to 25.50
No. 1 busheling scrap	12.50 to 12.75
No. 2 busheling scrap	8.50 to 8.75
Old car wheels	14.00 to 14.25
*Cast iron borings	9.75
*Machine shop turnings	10.50 to 10.75
†Sheet bar crop ends	15.00 to 15.25
Old iron rails	15.75 to 16.00
No. 1 R. R. wrought scrap	14.75 to 15.00
Heavy steel axle turnings	11.00 to 11.25
Stove plate	10.25 to 10.50

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Coke.—Just now there seems to be plenty of coke to meet the existing demand and the market is quiet. It is stated that if 200 or 300 more ovens would be blown in, that might cause a slight reaction in the price of coke but the market seems fairly strong. Most blast furnaces are pretty well covered on their requirements for the remainder of this year, and there is not much new inquiry. Sales of 5000 to 6000 tons of prompt furnace coke are reported at $2.15 to $2.25 per ton at oven. There are some inquiries in the market for furnace coke for next year, and some operators feel that $2.50 would be a fair price in view of the active conditions in the iron trade, and the probability of higher prices for pig iron, but this price is not tempting to the furnacemen and nothing has been done. We quote standard makes of furnace coke for prompt shipment at $2.15 to $2.25 per net ton at oven, and for the remainder of this year $2.25. The new demand for foundry coke is only fair, most consumers being covered. We quote 72-hr. foundry coke of standard grades at $2.40 to $2.50 per net ton at oven for prompt shipment and $2.50 to $2.75 for delivery over the remainder of this year. The output in the Upper and Lower Connellsville regions last week was 369,118 tons, a decrease over the previous week of about 5000 tons.

Chicago

CHICAGO, ILL., September 4, 1912.—*(By Telegraph.)*

The buying of pig iron in this market has continued in an increasing rather than diminishing volume, and there remains unfilled inquiry estimated conservatively at about 50,000 tons. The activity has been confined very largely to Northern iron, purchases being made for shipment in the last quarter, the first quarter and through the first half. Local furnaces are now so well sold up on prompt shipment iron that the local market has been advanced to the basis of $16 for that delivery, which is the same basis as iron for shipment in the first quarter. Numerous sales from 1000 to 10,000 tons are noted. In finished steel products the most interesting developments have to do with rail orders for 1913, of which about 200,000 tons are in immediate prospect. Orders for a total of 90,000 tons have been placed by two of the leading trunk lines. New car orders of the past week call for 3000 cars, and it is understood that the total purchases of the Canadian Pacific, including the 3000 reported last week, numbered over 6000. General market conditions with reference to other steel products are about as reported previously. A somewhat stronger tone prevails in the scrap market and prices are higher than a week ago.

Pig Iron.—Heavy buying of pig iron from local furnaces has characterized the past week's trading in this market. An eastern Wisconsin melter was a buyer of 10,000 tons; 5000 tons was placed with one implement manufacturer and 2000 with another. The sale of 3000 tons of malleable iron for western Illinois delivery and 8000 tons for shipment to an Iowa city are noted. In addition to numerous other sales of like quality, a large bulk of the business is made up of small orders widely distributed. Much of the buying was for delivery in the first quarter and through the first half of 1913, sales being made on the basis of $16 at the furnace, but a much larger tonnage than was anticipated was also placed for last quarter shipment as the result of which local furnaces have advanced the price of prompt shipment iron to the same basis as next year's iron, or $16. It seems likely that melters will experience some difficulty in filling further requirements for this year, particularly for basic iron. Southern iron continues to be held strongly and very little is now being offered on the basis of $12.50, Birmingham. Sales totaling several thousand tons for delivery in the first quarter have been sold on the basis of $13, this being the prevailing quotation for that shipment. The same price is also being asked in most instances for last quarter iron. We quote local irons, f.o.b. furnace, the average switching charge to Chicago foundries being nearly 50c. per ton. Other quotations are for Chicago delivery on prompt shipments as follows:

Lake Superior charcoal	$16.25 to $16.75
Northern coke foundry, No. 1	16.00 to 16.50
Northern coke foundry, No. 2	15.50 to 16.00
Northern coke foundry, No. 3	15.00 to 15.50
Northern Scotch, No. 1	16.50 to 17.00
Southern coke, No. 1 foundry and No. 1 soft	17.10
Southern coke, No. 2 foundry and No. 2 soft	16.60
Southern coke, No. 3	16.10
Southern coke, No. 4	15.60
Southern gray forge	15.10
Southern mottled	15.10
Malleable Bessemer	15.50 to 16.00
Standard Bessemer	16.75
Basic	15.50 to 16.00
Jackson County and Kentucky silvery, 6 per cent	18.40
Jackson County and Kentucky silvery, 8 per cent	19.40
Jackson County and Kentucky silvery, 10 per cent	20.40

(By Mail)

Rails and Track Supplies.—Negotiations about to be closed and pending for 1913 requirements of rails continue the center of interest among the producers

of the heavier finished products. While it is understood that no formal contracts have as yet been made, the distribution of 40,000 tons by the Northern Pacific, of which 5000 tons is to be placed with the Lackawanna Steel Company, 10,000 tons with the Pennsylvania Steel Company and the remainder with the Illinois Steel Company, has been arranged. The same is true with reference to 50,000 tons for the Chicago, Burlington & Quincy, which is to be divided between the Colorado and local mills. A number of the smaller railroads are buying and inquiring, and a total of approximately 200,000 tons is in the market of which a distribution may be considered as definitely in sight. The railroads seem chiefly concerned with securing the deliveries they desire, the question of financing apparently being one from which no trouble is anticipated. The negotiations for rails also include simultaneous requirements of track fastenings. For these latter materials the mills are from four to six weeks behind in deliveries. We have advanced our quotations on spikes and bolts and quote standard railroad spikes at 1.80c., base; track bolts with square nuts, 2.20c., base, all in carload lots, Chicago; tie plates, $30 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.20c. to 1.25c.; 16 to 20 lb., 1.25c. to 1.30c.; 12 lb., 1.30c. to 1.35c.; 8 lb., 1.35c. to 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The output of car builders is being hampered not only by delayed mill deliveries of material but by labor shortage. One plant near Chicago is operating scarcely more than 60 per cent. of capacity. The prospect of a rapid turning out of new cars is not particularly bright as a result except in so far as the labor situation is expected to be improved as soon as the season for outside railroad work is closed. New inquiries for cars include 2000 for the Missouri, Kansas & Texas, and 1000 for the Kansas City Southern. The most important contract for fabricated material placed the past week carried 3000 tons of riveted bridge structural material for the Pine Bluff, Ark., bridge, awarded to the American Bridge Company. This company also took contracts for 1629 tons for the Insurance Exchange Building, San Francisco; 725 tons of reinforcing frames for 1200 cars for the Wabash Railroad, and 137 tons for an office and theatre building at Gary, Ind. The St. Paul Foundry Company will fabricate 121 tons for the State Training School, at Red Wing, Minn., and the Leonard Construction Company will have 129 tons fabricated for a forge shop for Deere & Co., East Moline, Ill. The Chicago Sidewalk Light Company will fabricate 156 tons for a business block on Forty-seventh street, Chicago. The mill situation offers no new features and we quote for Chicago delivery, mill shipment, plain shapes 1.58c., and from store 1.95c.

Plates.—The situation as regards plates offers little that is new. Isolated instances are noted where delivery of sheared plates in carload lots is promised for 10 days but these instances are few and the 10 days is usually prolonged to 20. In view of the general situation there is a comparatively small amount of premium business and orders that can be placed at all are on a basis generally very close to 1.40c. Pittsburgh. We quote for Chicago delivery, mill shipment, 1.58c., and from store 1.95c.

Sheets.—Except for specifications and additional orders from customers who can accommodate themselves to the deliveries possible, the local sheet mills continue practically out of this market. Current new business taken by Eastern mills is practically on a one-price basis. Store prices have been relatively low as compared with advances on other products and new schedules for prompt shipment material are an immediate probability. We quote, Chicago delivery, as follows: Carload lots, from mill, No. 28 black sheets, 2.23c.; No. 28 galvanized, 3.33c.; No. 10 blue annealed, 1.68c. Prices from store are: No. 10, 2.05c.; No. 12, 2.10c.; No. 28 black, 2.55c., and No. 28 galvanized, 3.65c.

Bars.—This market shows no let up in the strength with which both iron and steel bars are being held by producers, and prices for hard steel bars are likewise higher. Deliveries show no improvement and the less desirable business is declined except at a premium. We have revised our prices and quote as follows: Bar iron, 1.45c.; hard steel bars, 1.40c. to 1.45c.; soft steel bars, 1.48c. to 1.55c., and from store, soft steel bars, 1.85c., Chicago.

Rivets and Bolts.—The new rivet prices announced last week seem to be largely nominal, not only because a considerable portion of the current business is still being taken on the basis of $1.98, Chicago, but because current orders are largely confined to specifications against old contracts placed at considerably lower figures. The wide spread between the latest prices and those prevailing but a short time ago presents an opportunity for considerable reselling of rivets. As yet there has been but little business contracted at the new prices for bolts and screws. We quote as follows: Carriage bolts up to ⅜ in. x 6 in., rolled thread, 75-10-10-2½; cut thread, 75-10-7½; larger sizes, 70-10-5; machine bolts up to ⅜ in. x 4 in., rolled thread, 75-10-10-7½; cut thread, 75-10-10-2½; larger sizes, 75 and 10; coach screws, 80-12½; hot pressed nuts, square head, $6.00 off per cwt.; hexagon, $6.70 off per cwt. Structural rivets, ¾ to 1¼ in., 1.98c. to 2.08c., base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Wire Products.—Fabricators of wire fencing are working day and night shifts at the mills to prepare for the anticipated large demand for wire fencing this fall, and the volume of fence wire specifications is consequently an important feature of this trade. The advance in wire products of $1 a ton, effective August 24, seems to have had a good effect on trade, for many who had not covered their requirements for the next 60 days hastened into the market, making a considerable volume of business for the week. Consumers of wire nails and barb wire are specifying freely. Many of the orders being received provide for immediate shipment. We quote as follows: Plain wire, No. 9, and coarser, base, $1.68; wire nails, $1.88; painted barb wire, $1.88 to $1.93; galvanized, $2.18; polished staples, 1.93; galvanized, $2.23, all Chicago.

Old Material.—The movement of country scrap has become noticeably restricted and manufacturers as well show little disposition to move their accumulations of scrap promptly. The recent trend of the market and the continued prospect of higher prices likewise have the effect of creating an apparent scarcity of material in dealers' hands. This general aspect of the market, coupled with actual advances in quotations, has created a stronger tone with respect to old materials. The demand for foundry scrap, particularly malleable, continues active, in part because foundries are preparing to carry heavier stocks in anticipation of shipment difficulties later as a result of car shortage. Mill consumers generally, while showing a somewhat broader manner of buying, are limiting themselves to the maintenance of stock on hand. The Chicago & Northwestern Railroad disposed of approximately 4500 tons of scrap in this market last week at prices from 25 to 50c. higher than consumers were paying. Other railroad lists include the Erie, Baltimore & Ohio, 600 tons from the St. Louis & San Francisco, 6600 tons from the Santa Fe, and 5000 tons from the Pennsylvania Lines west. We quote for delivery at buyer's works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton.	
Old iron rails	$16.50 to	$17.00
Old steel rails, rerolling	14.50 to	15.00
Old steel rails, less than 3 ft	13.00 to	13.50
Relaying rails, standard section, subject to inspection		24.00
Old car wheels	14.00 to	14.50
Heavy melting steel scrap	12.25 to	12.75
Frogs, switches and guards, cut apart	12.25 to	12.75
Shoveling steel	12.00 to	12.50
Steel axle turnings	9.75 to	10.25
	Per Net Ton.	
Iron angles and splice bars	$15.00 to	$15.50
Iron arch bars and transoms	16.25 to	16.75
Steel angle bars	11.75 to	12.25
Iron car axles	20.50 to	21.00
Steel car axles	16.25 to	16.75
No. 1 railroad wrought	12.75 to	13.00
No. 2 railroad wrought	11.75 to	12.25
Cut forge	12.00 to	12.50
Steel knuckles and couplers	11.50 to	12.00
Steel springs	12.25 to	12.75
Locomotive tires, smooth	13.25 to	13.75
Machine shop turnings	7.50 to	8.00
Cast and mixed borings	6.75 to	7.25
No. 1 busheling	10.75 to	11.25
No. 2 busheling	8.00 to	8.50
No. 1 boilers, cut to sheets and rings	8.50 to	9.00
Boiler punchings	12.50 to	13.00
No. 1 cast scrap	12.25 to	12.75
Stove plate and light cast scrap	10.50 to	11.00
Railroad malleable	12.50 to	13.00
Agricultural malleable	10.75 to	11.25
Pipes and flues	9.50 to	10.00

Cast Iron Pipe.—An additional letting of 2800 tons of cast iron pipe for Akron, Ohio, is scheduled for September 3 and it is also expected that an award will be made of the larger tonnage now pending in that city. A settlement of the large contract pending at Winnipeg, Canada, is expected to follow the sale of bonds this week. Arrangements for the financing of waterworks improvements are being made at Moline, Ill.; Wausau, Wis.; Nashville, Ill.; Logan, Iowa; Flan-

agan, Ill.; Dallas, Texas; Blanchard, Iowa; Smithland, Iowa; Fond du Lac, Wis., and Norfolk, Neb. We quote as follows, per net ton, Chicago: Water pipe 4 in., $30; 6 to 12 in., $28; 16 in. and up, $27, with $1 extra for gas pipe.

Philadelphia

PHILADELPHIA, PA., September 3, 1912.

Orders booked in August in practically all classes of crude and finished iron and steel products have been heavier than for many months and records were established by some of the Eastern mills. While there was a temporary suspension of buying over the holiday aggregate orders and specifications continue large. Pig iron prices continue to move upward, an advance of 25c. being general in foundry grades. Pig iron makers are still restricting sales and in foundry iron only a moderate business is entered for delivery beyond fourth quarter. Steel making grades are quieter, although negotiations for several blocks are pending. Premiums continue to be paid for prompt plates, shapes and steel bars. Iron bars are firmer. A fair business is moving in steel billets with further export inquiry noted. A local company reports a sale of 6000 tons of heavy open hearth steel rails for this year's delivery. The ore market is extremely quiet. A fair movement in some grades of old material is reported and the market gains in strength.

Pig Iron.—The holiday to some extent interrupted the steady flow of business, although aggregate sales, particularly in foundry grades, are still reported as being very heavy and the upward tendency of prices is pronounced. Consumers continue to make efforts to get contracts placed for extended delivery, but with most of the furnaces in this district well sold up for the remainder of the year little disposition to sell ahead is noted. Some sales involving deliveries over the next six months are reported, but in few instances are such transactions made on a minimum price basis. While some few options are out on standard brands of No. 2 X eastern Pennsylvania foundry iron at the $16 delivered basis very little under $16.25, delivered, is available, the majority of sellers holding at $16.50, and with several a minimum of $16.75, delivered here, is maintained for fourth quarter shipment. Stove founders have closed for a considerable quantity of iron for fourth quarter delivery, the aggregate being reported as between 3000 and 4000 tons, with further round lots under negotiation. General jobbing foundries have been buying freely in small and moderate lots, $16.50, delivered, for No. 2 being paid in a number of cases. Delaware River cast iron pipe makers, in addition to buying odd lots of off grade irons at prices close to $15.75, delivered, have made round lot purchases for early delivery, one melter taking 4000 tons of Southern high sulphur forge and 1500 tons of low grade Virginia. Negotiations are still under way for several thousand tons by another large pipe maker. While the movement in the higher Virginia grades of foundry iron has not been heavy a good volume of moderate lot business is being closed. The leading Virginia interest now quotes $14.25, furnace, for No. 2 X, although other sellers still accept orders at $14. In several cases, however, $14.50, furnace, is asked for prompt iron, while small unimportant sales of Virginia No. 2 X for first quarter were made at $14.50, furnace. Very little demand for rolling mill forge iron is reported, prices being strong at $15.75 to $16, delivered. While no further sales of basic iron have been reported in this district one melter is negotiating for 6000 to 8000 tons for delivery over the next six months, while another who recently purchased a small lot is inquiring for 5000 to 10,000 tons additional. Sellers of basic are now firmly holding at $16.50, delivered, for that grade. Little new business has developed in standard analysis low phosphorus iron, prices for which are firm at $21.50 minimum, delivered here. Lebanon low phosphorus is strong at a higher level, two lots aggregating 2500 tons being sold at $18, furnace, for delivery over the remainder of the year. Prices for foundry grade show a somewhat wider range, depending on sellers' position as to orders. Several producers in this district are now out of the market. The following range of prices represent the market for standard brands, delivery in buyer's yards, through the remainder of the year:

Eastern Pennsylvania No. 2 X foundry	$16.25 to $16.50
Eastern Pennsylvania No. 2 plain	16.00 to 16.25
Virginia No. 2 X foundry	16.80 to 17.00
Virginia No. 2 plain	16.55 to 16.75
Gray forge	15.75 to 16.00
Basic	16.50
Standard low phosphorus	21.50

Iron Ore.—There is practically no demand, either for foreign or domestic ores. Importations during the week were confined to a cargo of 3900 tons of Cuban ore. Total importations at this port in August aggregated about 105,300 tons.

Billets.—A very fair volume of business is moving and some contracts have been closed for delivery over the remainder of the year. Mills are pretty well sold ahead, and while $25.40 delivered here is the nominal basis for basic open hearth rolling billets, premiums of several dollars a ton are readily paid for prompt shipments. An inquiry for 1000 tons of open hearth rolling billets for export is noted. The demand for forging billets continues active. Prompt deliveries command premiums, minimum quotations for ordinary forging billets being $30 Eastern mill.

Plates.—A very heavy volume of miscellaneous business continues to come to Eastern mills. A number of fair sized contracts have been closed for deliveries extending over the remainder of the year at full prices, while some business has been done at a premium of several dollars a ton. During the week few large sized inquiries have developed. Mills continue to receive record specifications and are operating all their capacity, although the output is still restricted by labor shortage. Quotations are firm, sheared plates being held at 1.55c. minimum and universal plates 1.60c. minimum delivered in this district.

Structural Material.—Few new projects of any size have developed; in fact fabricating plants as well as the mills are so heavily booked that they are not anxious for any heavy volume of new business. A moderate amount of small work is coming out but delays in delivery of plain material have handicapped output. Mills are fully engaged, and while 1.55c. delivered is quoted for delivery in several weeks, up to 1.75c. Eastern mill is being paid for particularly prompt shipment.

Sheets.—A very satisfactory demand for sheets is noted. Mills are fully engaged and are unable to make desired deliveries on some grades. More forward business is on Eastern books than has been the case for a long period. Quotations are very firm, Western sheets, delivered here, are quoted at 1.65c. for No. 10 gauge, while Eastern mills making smooth loose-rolled sheets, readily obtain an advance of ¼c. to ½c. per lb., with prompt shipment.

Bars.—The demand for iron bars has been more active, due to a certain extent to the difficulty in obtaining satisfactory deliveries of steel bars. Sharp premiums continue to be paid for prompt deliveries on steel bars. Makers of iron bars are decidedly firmer in their views regarding prices, ordinary iron bars being quoted at 1.40c. to 1.45c. delivered in this district.

Coke.—More inquiry for furnace coke is noted both for last quarter and for first half of 1913. In one instance 30,000 tons is under consideration. Business recently has been confined to transactions in prompt furnace coke, for which the quotation is about $2.25 at ovens. Forward furnace coke is quoted at $2.35 to $2.50 at ovens. A moderate movement in foundry coke at unchanged prices is noted. The following range of prices per net ton represents the market for deliveries in this district:

Connellsville furnace coke	$4.10 to $4.60
Connellsville foundry coke	4.55 to 4.70
Mountain furnace coke	3.70 to 4.20
Mountain foundry coke	4.15 to 4.30

Old Material.—The market continues strong. Moderate purchases of heavy melting steel are being made by consumers in this district at prices ranging between $14.50 and $15 delivered, while dealers are paying $14.50 freely. A good deal of the buying by the mills is quietly done. Rolling mill grades are strong but purchases have been principally in small lots. Dealers are not forcing business, but as a rule hold back for higher prices. The following prices represent the market for deliveries in buyers' yards, eastern Pennsylvania and nearby points taking a freight rate ranging from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel scrap and crops	$14.50 to $15.00
Old steel rails, rerolling (nominal)	16.00 to 16.50
Low phosphorus heavy melting steel scrap	17.75 to 18.25
Old steel axles	17.50 to 18.00
Old iron axles	24.00 to 25.00
Old iron rails (nominal)	16.50 to 17.00
Old car wheels	14.25 to 14.75
No. 1 railroad wrought	16.00 to 16.50
Wrought iron pipe	13.00 to 13.50
No. 1 forge fire	12.50 to 13.00
No. 2 light iron (nominal)	7.50 to 8.00
Wrought turnings	10.75 to 11.25
Cast borings	9.75 to 10.00
Machinery cast	13.75 to 14.25
Grate bars, railroad	10.50 to 11.00
Stove plate	10.50 to 11.00
Railroad malleable (nominal)	12.50 to 13.00

Ferroalloys.—While little business has been done in ferromanganese in this district, sales of 80 per cent. to Western consumers have been made for first half delivery at $53.50, seaboard. Ferromanganese for delivery over the remainder of this year is scarce and prices are quoted nominally at from $55 to $58 seaboard. Some little inquiry for ferrosilicon is noted, prices of which are very firm, as makers are quite well sold ahead.

Cleveland

CLEVELAND, OHIO, September 3, 1912.

Iron Ore.—The demand for small quantities is holding up well, a number of sales having been made in lots up to 40,000 tons. The demand for vessel tonnage for the grain trade has become heavy at an advance in rates and this has made it difficult to obtain charters for ore. Few boats are available for ore cargoes, and while the ore carrying charges have not been advanced it seems probable that ore shippers will have to pay higher rates before the end of the season. In view of the condition of the Lake shipping trade, ore firms in making sales now are stipulating in the contracts that should the carrying charges be advanced the buyers are to pay a corresponding advance. We quote prices as follows: Old Range Bessemer, $3.75; Mesaba Bessemer, $3.50; Old Range non-Bessemer, $3.05, and Mesaba non-Bessemer, $2.85.

Pig Iron.—The market is active and very firm. Prices on foundry grades have advanced quite sharply in the last few days. For No. 2 foundry $14.75 for the first half delivery is now being quoted quite generally in the Valley and it is believed that little iron, if any, can be had at a lower price. One seller sold considerable at $14.50 to $14.65 before making the last advance. Locally the market is very firm at $14.75 at furnace for the first half for both local delivery and outside shipment. We note the sale of one 500-ton lot and a 2000-ton lot at that price for first half delivery and several smaller lot sales for shipment to northern Ohio points at the same price. Sales of foundry grades by local interests outside of this territory have in the aggregate been quite heavy in lots up to 1000 tons. The demand for malleable iron is also quite active. Prices on No. 2 foundry have been advanced to $15 and $15.25, Toledo, and $15.75, Detroit. The buying movement by foundries for the first half has become quite general. With the rising market consumers are anxious to anticipate their requirements. There is not much inquiry for the remainder of the year, but the supply available for last quarter is light and the same prices are generally being asked as for delivery through the first half. Among the new inquiries for the first half there are one from northern Ohio for 1800 tons of No. 2 foundry, one for 500 tons of malleable and others for 500-ton lots of foundry. An Erie engine builder is in the market for 700 tons of No. 2 foundry and another Erie inquiry is for 200 tons, both for this year. Furnace No. 2 of Corrigan, McKinney & Co., Cleveland, was relighted September 1 after being out four days because of a slip. For prompt shipment and the remainder of the year we quote, delivered Cleveland, as follows:

Bessemer	$15.65
Basic	$14.75 to 15.00
Northern No. 2 foundry	14.75 to 15.00
Southern No. 2 foundry	16.35
Gray forge	13.75 to 14.00
Jackson County silvery, 8 per cent. silicon	18.05

Coke.—The market is not active but firm. There is an unconfirmed report of the sale of some furnace coke for first half at $2.50. Some producers are considerably behind on shipments of foundry grades. Some have withdrawn quotations below $2.75 for foundry coke. We quote Standard Connellsville furnace coke at $2.25 to $2.30 per net ton at oven for spot shipment and $2.30 to $2.35 for contract. Standard 72-hr. foundry coke is held at $2.50 to $2.75 for prompt shipment and contract.

Finished Iron and Steel.—There is a good demand for all lines of finished material in carload lots and under for prompt shipment. Mills generally are about sold up on all their products for the remainder of the year and are doing their best to satisfy the demand of their customers who continue to crowd for their deliveries. In new business the demand for steel bars is particularly active in lots running up to 100 tons, but buyers are having much trouble in placing their orders. A large share of the tonnage is wanted for reinforcing work. Steel bars for early delivery are scarcer than at any time during the past few months. Local mills that have been selling steel bars for prompt shipment at 1.70c., Pittsburgh, are now well sold up and are asking warehouse prices for the tonnage they still have available. The bar iron market is firmer and local mills are well filled up. We quote iron bars at 1.50c., at mill, for Cleveland delivery and 1.40c. to 1.45c. for outside shipment. Eastern plate mills are taking carload orders for prompt shipment in this territory at 1.50c., Pittsburgh, for sheared and 1.55c. for universal. Structural material for quick delivery is being sold by Eastern mills in less than carload lots at 1.55c., Pittsburgh, or 1.73c., delivered Cleveland. The new demand for structural material for small building work continues active. The McMyler-Interstate Company, Bedford, Ohio, has taken 350 tons for new buildings for the Superior Foundry Company, Cleveland. The demand for billets is fair and sales are being made in this market at an advance of $1 a ton over recent prices. We quote forging billets at $30 to $30.50, Pittsburgh. Sheets are in good demand and the market is firm at 2.05c. for No. 28 black, 3.15c. for No. 28 galvanized and 1.50c. for No. 10 blue annealed. To secure deliveries next year, should rail mills become crowded, one railroad has reserved in this market a round tonnage for March and April rolling. The village of Nottingham, Ohio, will receive bids September 16 for 450 tons of cast iron water pipe.

Old Material.—The local demand is not active. The quiet condition of the market is partially attributed to the fact that numerous buyers are away on vacations. Local mills are still holding back on shipments and have material under contract for their early needs. The market is firm and dealers look for considerable activity this month. They are unwilling to sell for future delivery at present prices. The advance in price of pig iron has caused a better demand for cast scrap, the price for which is not as yet advanced. Some inquiry has developed for relaying rails. Railroad lists out and dates of closing this week are the Wheeling & Lake Erie, September 2; Baltimore & Ohio, September 3, and Erie, September 4. Dealers' prices, f.o.b. Cleveland, are as follows:

Per Gross Ton.

Old steel rails, rerolling	$14.00 to $14.50
Old iron rails	14.00 to 14.50
Steel car axles	18.50 to 19.00
Heavy melting steel	13.00 to 13.50
Old car wheels	13.00 to 13.50
Relaying rails, 50 lb. and over	22.00 to 22.50
Agricultural malleable	10.50 to 11.00
Railroad malleable	13.00 to 13.25
Light bundled sheet scrap	10.00 to 10.50

Per Net Ton.

Iron car axles	$18.50 to $19.00
Cast borings	7.50 to 7.75
Iron and steel turnings and drillings	8.00 to 8.25
Steel axle turnings	8.50 to 8.75
No. 1 busheling	11.00 to 11.25
No. 1 railroad wrought	12.50 to 13.00
No. 1 cast	11.50 to 12.00
Stove plate	9.50 to 10.00
Bundled tin scrap	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, September 4, 1912.—(*By Telegraph.*)

Pig Iron.—Although business is brisk the aggregate of sales is not so great as for the previous week. The inquiry coming in indicates that the heavy buying in the past three weeks did not include all melters in this territory by any means. The distinctive feature of the present market is the firm attitude on prices assumed by Northern and Southern furnace interests. Northern furnacemen have advanced their quotations on No. 2 foundry to $14.50, Ironton, for any shipment this year, but there is a small quantity of resale iron obtainable below this figure. Southern prices for prompt shipment are advancing, and the minimum of $12, Birmingham basis, has almost disappeared and is confined to irons produced outside the Birmingham district proper. The majority of operators are holding out for about $12.50 to $13 for movement during the remainder of the year and the first quarter of 1913. Basic is in better demand, and in addition to a round tonnage that was recently sold a southern Ohio manufacturer other purchases are expected to be made in this territory at an early date. Malleable continues active and a central Ohio firm has sent out the latest inquiry for 1000 tons, but for shipment in the second quarter of next year. This company also wants a like quantity of foundry iron to be delivered during the same period. A central Ohio melter is asking for 1500 tons of Southern No. 2 foundry and 900 tons of silvery iron for first quarter shipment. From the same territory are other inquiries ranging from 500 to 800 tons each of both Northern and Southern foundry, and several Indiana consumers are trying to cover for the first half for a supply of both foundry and mal-

leable. A nearby company bought about 700 tons of Southern foundry for the first half at $12.50, Birmingham, and an Indiana concern took on 1200 tons of Northern No. 2 foundry at $14.50, Ironton. Lake Superior charcoal has advanced 50c. a ton, and late sales in this territory include 2000 tons for shipment in the next six months. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	$15.75 to $16.25
Southern coke, No. 2 foundry and 2 soft	15.50 to 16.00
Southern coke, No. 3 foundry	15.00 to 15.25
Southern coke, No. 4 foundry	14.75 to 15.00
Southern gray forge	14.75 to 15.00
Ohio silvery, 8 per cent. silicon	17.70 to 18.20
Southern Ohio coke, No. 1	15.95 to 16.40
Southern Ohio coke, No. 2	15.70 to 16.20
Southern Ohio coke, No. 3	15.20 to 15.70
Southern Ohio malleable Bessemer	15.70
Basic, Northern	15.20
Standard Southern car wheel	25.75 to 26.00
Lake Superior charcoal	17.25

(By Mail)

Coke.—On account of the continued and acute labor shortage in producing districts, as well as the action by some of the railroads in withdrawing stock and box cars for carrying coke, it is predicted that furnace coke in all three fields may again seek a higher level. However, so far quotations remain around $2.25 to $2.40 per net ton at oven for Connellsville 48-hr. brands, but in the Wise County field the last named price is more nearly correct for either prompt or contract business. Pocahontas furnace coke is obtainable as low as $2.15 to $2.25, but shipments are seriously delayed on account of insufficient rolling stock. Foundry coke in all three districts is quoted around $2.50 for prompt shipment, and as high as $2.75 per net ton at oven on contract business.

Finished Material.—Warehouse stocks are steadily getting lighter, and mill agencies report a fast accumulation of orders, that are daily necessitating advancing delivery dates. The local mill reports a fast increasing call for sheets and structural material is also improving.

Old Material.—There is an improved demand from nearly all consuming interests, and prices on several classes of scrap have advanced from 25c. to 50c. a ton. It is rumored that the rolling mills are quietly feeling the market, and business from this source may be rather brisk soon. The minimum figures given below represent what dealers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum figures are dealers' selling prices, f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$9.50 to $10.00
Old iron rails	13.25 to 13.75
Relaying rails, 50 lb. and up	20.75 to 21.75
Rerolling steel rails	11.50 to 12.00
Melting steel rails	10.50 to 11.00
Old car wheels	12.50 to 13.00

Per Net Ton.

No. 1 railroad wrought	11.00 to 11.50
Cast borings	6.50 to 7.00
Steel turnings	7.25 to 7.75
No. 1 cast scrap	11.00 to 11.50
Burnt scrap	7.75 to 8.25
Old iron axles	17.25 to 17.75
Locomotive tires (smooth inside)	12.00 to 12.50
Pipes and flues	7.25 to 7.75
Malleable scrap	8.75 to 9.25
Railroad tank and sheet scrap	6.75 to 7.25

Birmingham

BIRMINGHAM, ALA., September 2, 1912.

Pig Iron.—The price is still hardening, with a large volume of sales made into the first quarter of next year at $12.50 to $13 and a general disposition to hold to $13 for all future 1913 business. The furnace company that has led the price advance in the past several weeks, and closed its books at $13 after selling a considerable quantity for 1913 at $12.50, sold 5000 tons at $13 the past week and still avers that it has nothing under $13 for any delivery. It is sold to about April 1. It reports sales of No. 4 at $12.25 for various deliveries and sales of gray forge at $11.50 for this year. Another interest is reported as being well sold into the next half of 1913 and to be on a $13 basis. Total sales of Birmingham furnaces in August probably reached 200,000 tons and over, of which 120,000 tons was for 1913 delivery, and it is estimated that 70,000 tons for that delivery brought $13. One large interest is again out of the market after reputed sales of 20,000 tons into the first quarter at $12.50 to $13. Several sales of spot iron have been made at $13. Regular customers probably secure reductions from these figures for special lots, but $12.50 to $13 for 1913 is the minimum, with $13 adhered to by at least three large interests. With iron scarce and an enormous home consumption, competitive points are not having the influence on price making they formerly had, and this fact is noted by reports from those points. The largest interest has blown in another furnace in order probably to take care of pipe company orders and at the demands of its own finishing mills at the same time. The charcoal iron output is sold ahead for several months and a third furnace is reported as to go in soon. A sale of 15,000 tons of basic by one Alabama concern to another, which is a steel maker, is reported. The foundry market is still tending to further advances in prices, but not in a feverish way. Reductions in stocks in September have something to do with this. While the most recent sales for 1913 appear to have been on a $13 basis, it might still be safe to say from a conservative standpoint that 1913 prices are $12.50 to $13, with a leaning toward higher levels, while minimum prices for spot and fourth quarter on the same conservative basis, f.o.b. cars, Birmingham, are as follows:

No. 1 foundry and No. 1 soft	$13.00 to $13.50
No. 2 foundry and No. 2 soft	12.00 to 12.50
No. 3 foundry	11.75 to 12.25
No. 4 foundry	11.50 to 11.75
Gray forge	11.25 to 11.50
Basic	12.00 to 12.50
Charcoal iron	22.50 to 23.00

Cast Iron Pipe.—The pipe makers are reported as securing the new price levels without difficulty and quote as follows per net ton, f.o.b. cars, Birmingham: 4 in., $25; 6 in. and up, $23, with $1 added for gas pipe. Orders of the past week have not been large in quantity, but show that the trade is holding up well, while production is still at almost maximum with yards bare and shipments heavy.

Coal and Coke.—Orders for coal for future delivery are being placed with a greater degree of regularity than for some time. The New Orleans, Mobile & Chicago Railroad has given its first order to the Birmingham district, the amount being 150,000 tons. Coke is firm at $3.25 to $3.75 per net ton, f.o.b. cars at oven.

Old Material.—The market is more active and prices obtained in several grades have been in line with those asked. Wrought and cast are moving out of yards in considerable quantities. Steel grades and relaying rails are demanding attention. Prices quoted by dealers, per gross ton, f.o.b. cars, Birmingham yards, are as follows:

Wrought iron car axles	$15.00 to $16.00
Old steel axles	13.50 to 14.50
Old iron rails	13.50
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	10.00
No. 1 country wrought	8.50 to 9.00
No. 2 country wrought	8.00 to 8.50
No. 1 machinery	9.00 to 9.50
No. 1 steel	9.50 to 10.00
Tram car wheels	10.00 to 10.50
Standard car wheels	10.50 to 11.00
Light cast and stove plate	7.00 to 7.50

St. Louis

ST. LOUIS, MO., September 2, 1912.

The activity in the iron and steel market continues to gain in volume with the result that representatives are convinced that the demand for consumption will continue heavy all through the coming months of 1912 at least. Prices are firmer than ever, and with mills and furnaces withdrawing from the market or requiring submission of orders before acceptance there is every evidence here of an expected rise in quotations. Collections continue excellent, showing that the material bought is going rapidly into use.

Pig Iron.—Sales of pig iron of all classes have been increasingly heavy the past week, and a large tonnage is included in inquiries not yet filled. The sales will total close to 25,000 tons and may exceed that figure. Included in the transactions have been one of 2000 tons of No. 2 Southern, another of 3500 tons, another of 1000 tons and a group of sales aggregating about 12,000 tons, part Northern and part Southern, to Waterloo, Iowa, purchasers. There have also been a large number of sales in small lots running to a total of 5000 or 6000 tons, both Northern and Southern. All these are reliable reports, while there are still others said to have been withheld for various reasons. One of the most notable features of the week has been the entry of the small melters into the market—the foundries of the outlying territory whose melt will run perhaps 100 tons per month.

A large number of these have bought and others have put forth inquiries. Inquiries which are now in the market unfilled include one for 10,000 tons of Northern basic and another for 5000 tons of the same grade, both for delivery over the first half of next year. There are still others for 2000 tons and 1000 tons each, while the aggregate of the small inquiries is larger than at any time in a year. Prices quoted now are $12.50 to $13 for No. 2 Southern, Birmingham basis, for delivery through the remainder of the year. The price for the first half is $13, and in most instances this is accompanied with a requirement of reference to the furnace before closing. Lake Superior charcoal iron is up 50c. per ton, being $15.50 to $16.50 at furnace, according to conditions and quality. No. 2 Northern iron, Ironton basis, is quoted at $14.50 for this year and $15 for first half.

Coke.—The activity of coke in this market is confined chiefly to specifications on contracts and these are running up handsomely above actual contract conditions.

Finished Iron and Steel.—The Missouri Pacific purchase has been increased from 10,000 to 15,000 tons of standard section steel rails. Aggregating of the figures of the Frisco shows that the rail takings for the current year, delivered and specified for the remainder of 1912, will run between 50,000 and 55,000 tons. None of the roads in this territory has made contracts for 1913 delivery, although there are some informal inquiries out to determine the temper of the market for next year. In light rails the demand is increasing rapidly and both the coal and the lumber interests are becoming eager buyers. Track fastenings have been in very good demand. In structural material the tonnage of the past week has been heavy, but the only large individual item was the closing by the American Bridge Company of 3700 tons for the new east side smelter of the Granby Mining & Smelting Company. The fabricating shops are exceptionally busy and are unable to get material in satisfactorily frequent delivery. Bars have been very strong, both for reinforced concrete use and for general requirements. The wagon and implement interests are active buyers. In plates the orders are such as to literally swamp the mill representatives. The orders are growing larger with each succeeding week and are coming from all sources. The Missouri, Kansas & Texas Railroad entered the market during the week with an inquiry for 2000 freight cars for delivery in May and June of next year.

Old Material.—The scrap market reflects the conditions existing in the other divisions of the steel and iron industry and prices are firmer, with some advances. There is considerably more inquiry from the local foundries and those in the surrounding territory which have not been in the market recently are active buyers now. Relaying rails have been unusually strong and very hard to get. This has been especially true of the light relayers. Many plants which have been light buyers of scrap are increasing their forces as rapidly as they can obtain labor and material. Agricultural malleable is much wanted. Lists out to close during the week include one of 600 tons from the St. Louis & San Francisco and one of 2000 tons from the Missouri Pacific. Others have been delayed by the succession of holidays but are expected during the week. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.

Old iron rails	$15.00 to $15.50
Old steel rails, rerolling	13.00 to 13.50
Old steel rails, less than 3 ft.	11.75 to 12.25
Relaying rails, standard section, subject to inspection	23.00 to 23.50
Old car wheels	15.00 to 15.50
Heavy melting steel scrap	11.50 to 12.00
Frogs, switches and guards cut apart	11.50 to 12.00

Per Net Ton.

Iron fish plates	$13.00 to $13.50
Iron car axles	19.00 to 19.50
Steel car axles	16.50 to 17.00
No. 1 railroad wrought	11.50 to 12.00
No. 2 railroad wrought	11.00 to 11.50
Railway springs	10.50 to 11.00
Locomotive tires, smooth	13.00 to 13.50
No. 1 dealers' forge	9.00 to 9.50
Mixed borings	6.75 to 7.25
No. 1 busheling	10.00 to 10.50
No. 1 boilers, cut to sheets and rings	8.00 to 8.50
No. 1 cast scrap	11.50 to 12.00
Stove plate and light cast scrap	9.00 to 9.50
Railroad malleable	10.00 to 10.50
Agricultural malleable	9.00 to 9.50
Pipes and flues	8.00 to 8.50
Railroad sheet and tank scrap	8.00 to 8.50
Railroad grate bars	9.00 to 9.50
Machine shop turnings	7.50 to 8.00

San Francisco

SAN FRANCISCO, CAL., August 27, 1912.

Some merchants in southern California and the interior, who had the heaviest sales in their history in July, report a slight reaction this month, but on the whole the distributive movement remains at about the former volume. Stocks in one or two lines are fairly large, but supplies of most materials have been greatly reduced, and several large manufacturers, as well as merchants, are beginning to suffer from the delayed deliveries by mills. Specifications on old contracts continue extremely heavy, but new buying is hardly as extensive as the situation would seem to warrant.

Bars.—Orders for soft steel bars from small shops and factories continue somewhat above the average for this season. Some merchants are carrying good sized stocks of foreign material, but are specifying fairly well for sorting-up purposes, while others less amply supplied are buying freely. The tonnage of reinforcing bars recently booked is very heavy, and more new business is offered than can easily be taken care of. Many buyers want early delivery, while some of the mills are out of the market entirely. At least one mill on the coast is still able to make prompt deliveries, however, refusing to dispose of its output on contracts for extended delivery. Prices are firmly held; soft steel bars from store, San Francisco, being quoted at 2.40c., and iron at 2.30c.

Structural Material.—The August tonnage is the best in several months, including some fairly large jobs, though much of the small work recently figured has been delayed. The principal contracts are the St. Francis Hotel addition, about 2200 tons, taken by Milliken Bros., and pier 26, taken by the McClintic-Marshall Construction Company, which also has the San Francisco armory contract. Figures have just been submitted on the Insurance Exchange, requiring about 1600 tons. The Western Iron Works has a small contract for the Shreve factory building. Prospects are favorable all over the coast. Figures are being taken on the Pacific Gas & Electric Company's building at Sacramento, about 150 tons, and several important projects at Los Angeles are up for preliminary figures, the most important being that of the Fireproof Building Company. It is proposed to divide the local city hall job among several local firms, and this should be ready for figures in a month or two, the U. S. Subtreasury being expected about the same time. Arrangements are being made to build a municipal opera house in addition to the auditorium on the civic center site. Steel plans for the Oakland auditorium are about ready for figures. The city of Spokane, Wash., is arranging for the sale of $250,000 bonds for a new city hall, and a bond issue of $950,000 is contemplated for a court house at Seattle. Plans are under way for a $200,000 building for G. W. Fisher in that city. The Honolulu Iron Works has the general contract for a steel sugar mill for the Koloa Plantation Company. Local fabricators are greatly hampered in undertaking new work by difficulty in getting deliveries of structural shapes but believe that the shortage will be relieved somewhat by arrivals of foreign material during the fall.

Rails.—The aggregate tonnage is well maintained, though the bulk of current business is on small scattered orders. Street railroads are buying freely, their principal orders being for grooved girder rails.

Sheets.—Slow deliveries are causing more complaint in this line than in any other, several merchants both here and in the interior being practically sold out. This quarter's requirements are well covered by contracts, and specifications are extremely heavy, but the material is not at hand, while small consumers are clamoring for supplies. Some large manufacturers of riveted pipe, who have been running double shift, are also short of stock.

Plates.—While deliveries are very slow, the jobbing demand is not especially heavy. Some new business is coming out, both in tank and marine plates, but the current tonnage is only moderate. The Standard Oil Company has started work on 15 new stills at the Richmond refinery, and the Willamette Iron Works, Portland, Ore., has a contract for a 150,000-gal. tank at Tallant, Ore. The Mare Island Navy Yard has received orders to proceed on its gunboat contract, and the Craig ship plant at Long Beach, Cal., has another lumber steamer contract.

Merchant Pipe.—Merchants note little if any curtailment in the small trade, and specifications are unusually heavy for this time of year. While black pipe is fairly plentiful, stocks of galvanized are running short of current needs, and delay in deliveries is increasing. A slight improvement in oil-country goods

is noted, and with the increased transportation facilities now being installed considerable activity in this line is expected.

Cast Iron Pipe.—Considerable activity is reported in southern California and at the north coast cities, but there is little movement in this vicinity. The contract at Oxnard, Cal., will be let this week, and the city of Los Angeles will take bids September 10 for 4029 tons. The city of Pasadena plans to lay new mains at a cost of $10,000. The city of San Diego has voted in favor of a bond issue of $2,500,000 for the acquisition of a water system. The Pacific Gas & Electric Company plans to lay a lot of 16-in. pipe at Fresno. Several new inquiries are in sight around Portland and Seattle. Prices for coast delivery have advanced about $1 per ton since last report.

Pig Iron.—This market is firmer in sympathy with Eastern conditions, though there is little movement. Delayed shipments of English iron have arrived, amounting to about 4000 tons, which naturally curtails the demand for domestic iron. This was sold to arrive at the old prices, around $22, and some of it will probably be resold, the present nominal value being about $24. Some Southern foundry iron is moving, however, and a few inquiries have come out for fourth quarter delivery. No. 2 Southern foundry, f.o.b. San Francisco, is quoted at $22.60.

Old Material.—Cast iron scrap continues in fair demand, prices being firmly held at the former level. There is still considerable steel melting scrap on hand, but the movement is comparatively active, with occasional sales to local interests. About the only movement of rerolling rails is on old contracts. Prices are quoted as follows: Cast iron scrap, per net ton, $14; steel melting scrap, per gross ton, $11.50; wrought scrap, per net ton, $12 to $15; rerolling rails, per net ton, $11.

Buffalo

BUFFALO, N. Y., September 3, 1912.

Pig Iron.—The state of the market remains about the same as last week—very strong in all grades, with prices still showing an advancing tendency and with a fair volume of sales and inquiry. The aggregate placed of foundry, malleable and charcoal iron was about 30,000 tons, with between 10,000 and 15,000 tons still under negotiation. Sales and inquiry were largely for 1913 delivery—first quarter and half. Furnaces are now practically sold up to the end of the year and a large percentage of the output of all furnaces in this district for the first quarter of next year has already been booked. There has been a sharp advance in charcoal for first half delivery, amounting to 50c. per ton and as per the minimum of the schedule given below for the remainder of 1912. The other items in the price schedules have also been marked up, including basic. Present buying covers a wide classification of uses: For railroad and general foundries, stove and radiator manufacturers, pipe and machinery makers, etc. Furnaces are heavily burdened with rush shipping directions, there being apparently a general increase in urgent requirements and consumers being very insistent upon quick deliveries to cover their immediate needs. We quote as follows for the remainder of this year and first quarter of 1913, f.o.b. Buffalo:

No. 1 foundry	$15.50 to $15.75
No. 2 X foundry	15.25 to 15.50
No. 2 plain	15.00 to 15.25
No. 3 foundry	15.00
Gray forge	15.00
Malleable	15.50 to 15.75
Basic	15.25 to 15.50
*Charcoal, according to brand and analysis	16.50 to 18.00

*For some of the higher grades and analysis $20 is asked.

Finished Iron and Steel.—The volume of business for the last week in August has been of large proportions. Specifications fully covering balances of monthly quotas were received, making a very large total for the week in all lines and a total of record breaking character for the month, the bulk of orders being for current actual consumption and not for carrying. Some of the larger consumers are endeavoring to cover themselves on contracts for the first half of next year, but most producers are not yet ready to consider such business, believing it to be too early to quote on contracts running into 1913. Most mills find the tonnage they now have under contract will keep them busy until well into the first quarter of next year and desire to determine more nearly what their booked obligations are before committing themselves on further tonnage. In fabricated structural lines prices are stiffening and deliveries are being set farther back. It is difficult to obtain promise of delivery for even small building projects before the end of the year and large projects require more extended dates. A number of building operations have already been postponed until next spring on this account. No plans for buildings of particular importance have come up for figuring during the week, but a number will soon be in readiness for bids. Figures will be taken next week for the John W. Gibbs building, Buffalo, 500 tons, and bids are to be received September 26 for three additional buildings at Cornell University.

Old Material.—A heavier demand is noted in many lines, the inquiry from outside districts particularly being much larger than for the preceding week. Considerable new business has been transacted at advancing prices. Dealers are selling only for immediate delivery, however, expecting that a still higher level of prices will soon be established. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$13.50 to $14.00
Low phosphorus steel	16.25 to 17.00
No. 1 railroad wrought	13.75 to 14.50
No. 1 railroad and machinery cast scrap	13.50 to 14.25
Old steel axles	15.75 to 16.50
Old iron axles	22.50 to 23.00
Old car wheels	13.50 to 14.00
Railroad malleable	12.50 to 13.00
Boiler plate, sheared	14.25 to 14.75
Locomotive grate bars	11.25 to 11.50
Wrought pipe	9.75 to 10.25
Tank iron	10.25 to 10.50
Wrought iron and soft steel turnings	8.25 to 8.75
Clean cast borings	7.50 to 8.00

Boston

BOSTON, MASS., September 3, 1912.

Old Material.—The market continues to improve, with better prices in most classes of scrap. Dealers realize that the season is a little too early for a complete understanding of the situation. They are confident that the next few weeks will see much stock released by the producers who are now holding back, and at the same time a continuance of the present excellent trade. The quotations given below are of prices offered by the large dealers to the producers and to the smaller dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points, taking Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$11.75 to $12.00
Low phosphorus steel	13.50 to 14.00
Old steel axles	14.50 to 15.00
Old iron axles	22.00 to 22.50
Mixed shafting	13.50 to 14.00
No. 1 wrought and soft steel	11.50 to 11.75
Skeleton (bundled)	10.00 to 10.50
Wrought iron pipe	10.00 to 10.25
Cotton ties (bundled)	10.00 to 10.25
No. 2 light	4.50 to 5.00
Wrought turnings	8.00 to 8.50
Cast borings	7.25 to 7.50
Machinery, cast	12.50 to 13.00
Malleable	10.00 to 10.50
Grate bars	7.75 to 8.00
Stove plate	8.50 to 9.00
Cast-iron car wheels	12.50 to 13.00

Semi-Finished Steel Scarce

Germany Selling Little in Great Britain—American Steel in Demand

(By Cable)

MIDDLESBROUGH, September 4, 1912.

All markets are very strong. There is a heavy business in pig iron, with daily advances in prices. Stocks of pig iron in Connal's stores are 287,415 tons, against 288,009 tons last week. Finished iron works are overwhelmed with orders and a large demand is developing for semi-finished steel. Consumers are evidently short of billets and sheet bars. The German Steel Works Union is meeting the demand sparingly, declining to sell sheet bars at present. American special quality open hearth forging blooms have sold at 112s. c. i. f. There is a good deal of inquiry for American steel. South Australia is inquiring for 5000 tons of rails. We quote as follows:

Cleveland pig iron warrants (closing Tuesday), 64s. 2½d. against 62s. 9d. one week ago.

No. 3 Cleveland pig iron, maker's price, f. o. b. Middlesbrough, 64s. 9d. against 63s. 3d. one week ago.

Steel sheet bars (Welsh) delivered at works in Swansea Valley £5 17s. 6d. to £6 2s. 6d. according to delivery.

German 2-in. billets, f. o. b. Antwerp, 102s. 6d.

German basic steel bars, f. o. b. Antwerp, £6, an advance of 2s. from last week.

Steel bars, export, f. o. b. Clyde, £7 15s. to £7 17s. 6d.

Steel joists, 15-in., export, f. o. b. Hull or Grimsby, £7 5s. against £7 2s. 6d. one week ago.

Steel ship plates, Scotch, delivered local yard, £8 2s. 6d.

Steel black sheets, No. 28, export, f. o. b. Liverpool, £9 10s., an advance of 5s. from last week.

Steel rails, export, f. o. b. works port, £6 7s. 6d. to £6 10s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f. o. b. Wales, 14s. 7½d., October-December.

(By Mail)

Conditions Auguring Advances in Pig Iron

MIDDLESBROUGH, ENGLAND, August 24, 1912.

The utmost confidence is felt in the continuance of the excellent trade conditions, and blast furnace owners, being very well sold, assume an attitude of indifference with respect to new business, professing faith in being able to realize considerably better figures in the not distant future. July and August are frequently slack months with the iron trade, partly owing to heat and to holiday arrangements, and this year has not been an exception, though the thermometer has night after night been registering three or four degrees of frost and for four weeks the country has been deluged with torrential rains which have wrought havoc to the crops. The meadows are still littered with cut grass in swathes, while side by side cut wheat and barley stand in the stacks blackening and rotting. The financial aspect of this terrible state of affairs for the farmers passes generally without comment, for England is a manufacturing rather than an agricultural nation, but the loss involved through the wholesale devastation is estimated at many millions sterling. Crop conditions from one end of the country to the other are almost hopeless and there can be no doubt that in one direction or another there must be a curtailment of buying power. Whether this can be felt to any appreciable extent during the next six months or so remains to be seen; probably it will not, but the loss of crops cannot pass altogether unnoticed.

New buying of pig iron has been on a small scale, especially for consumption, but the time is at hand when a fresh movement in this connection might be expected, and for this the speculators in Cleveland warrants have been preparing. There is some reason to fear that when the buying power develops actively, prices may be rushed, hence a word of caution should not be out of place. Actually the iron trade is good, very good, but prices are high, more furnaces are going into operation, and there is little likelihood judging from recent events and from present conditions that the visible supply will drop very much below the level to-day unless as the result of United States buying for consumption. Undoubtedly if America came along and took a few cargoes, the warrant market would leap up, and some folks think that such a contingency is by no means too remote. It needs some such development to justify anything above to-day's prices, yet notwithstanding this, market gossip speaks of 70s. as probable before the rise is exhausted. Unless developments of a totally unexpected nature to-day occur, such a price as that would be almost absurd.

Speculators are a pretty strong party just as present, and may take the bit between their teeth. Meanwhile the safe policy would be one of modified optimism as regards prices for raw, semi-finished and finished iron and steel, because really current values are about high enough in relation to trade considerations. Nevertheless a general further uplifting is looked forward to as being inevitable within a very short space of time.

The ore people are exceedingly strong just now and Spanish Rubio is now held for 22s. 6d. to 23s. c.i.f. Middlesbrough, after having sold lately at 22s. for 1913 delivery. For one thing freight rates are very stiff, some ship owners now asking 7s. 6d. for Bilbao-Middlesbrough tonnage. A very fair business has been arranged in hematite at firmer prices. East Coast mixed numbers selling at 74s. 6d. to 75s., and to-day the higher figure is the general quotation.

There has been a steady run of industrial development for some time in the direction of putting up new works and one of the latest schemes is the purchase by the Consolidated Diesel Engine Company of 22 acres of land at Ipswich in Suffolk with the option of taking a further 12½ acres. A complete plant will be laid down as soon as possible for turning out Diesel engines.

German Iron Market More Active

Scarcity in Semi-Finished Steel and Pig Iron

BERLIN, August 22, 1912.

The position of the iron trade has further improved. The scarcity of pig iron and semi-finished steel has become more pronounced—especially steel. A scarcity of certain kinds of foreign ores also begins to attract attention. According to all indications, buying by home consumers of steel and iron for 1913 delivery will assume great activity as soon as business is declared open and prices are fixed. At present all mills are busy on orders lasting them till the end of the year at least.

The price situation remains decidedly firm. This week there are further advances. From Essen it is reported that an average advance of 2 marks on steel bars has been made in consequence of the increased demand. This applies particularly to long contracts, for which the new price ranges between 122 and 125 marks. In the Silesian district bars and heavy plates have been marked up 2.50 marks. The Dortmund dealers' organization has rased bars, plates and bands by 5 marks for sales from stock. A similar organization at Düsseldorf is conferring with its various branches regarding a further advance.

The Ore and Pig Iron Situation

The ore market is strong. Home ores are taken as fast as mined. The furnaces are trying as far as possible to stave off engagements for Spanish ores at the present high prices (22 marks for 50 per cent. ores delivered at Ruhrort). Manganese ores from the Black Sea are also scarce and dear owing to the high ocean freights—a factor that will probably involve higher prices for spiegeleisen.

In pig iron home buying is only for supplementary quantities for the rest of the year, as next year's business has not yet been opened by the Pig Iron Syndicate. New foreign orders continue to come in steadily, some for delivery in 1913. Foundries are anxious to place orders for 1913, believing that the next price list will bring a rise. The Pig Iron Syndicate, as now appears, has not yet reached an agreement with the Luxemburg-Lorraine group regarding the continuance of the latter's existing arrangement beyond the end of the year. A meeting was held several days ago between that group and a committee of the Syndicate. The latter demanded that the furnaces in question enter the Syndicate as regular members upon the expiration of the present arrangement. They rejected this demand, however, and offered instead to prolong the present status to the end of 1915, when the Syndicate itself terminates, subject to renewal. The Syndicate representatives finally gave them till October 1 to consider the matter.

Much old material has been coming on the market from the annual stock-takings and from sales of old rails by the various railroad systems. For this reason consumers have been disposed to stand aloof in the hopes of getting price concessions, but prices appear to be fully maintained. The mills are, however, calling for material on order at a very active pace.

Trade in Finished Products Very Active

Owing to the great demand for semi-finished steel at home, the Union is hardly able to supply its foreign customers. There is considerable pressure by home consumers to get in supplementary orders for 1912 delivery. It is suspected that much of this is really intended for 1913 consumption by parties fearing a further advance of prices or greater difficulties in obtaining sufficient supplies next year.

According to the Cologne Gazette, carefully rolled open-hearth steel bars command 127.50 to 130 marks on quick delivery orders. The export trade in steel bars has become more active. The price for German basic bars, f.o.b. seaport, is 120 marks. Business in iron bars continues good and the mills are fully employed; prices are firmly held, with 143 marks as minimum. Mills running on bands are sold out to the end of the year; business for export has been taken very far ahead but the scarcity of steel material is a serious drawback. Strips for making steel tubing continue in heavy demand, the tube mills being very busy, particularly for export.

The situation of heavy plates has grown even better than it was. Orders are coming in very briskly, as the shipyards and other consumers are anticipating increased difficulties in obtaining material next year. There is prospect of further business in this line. There is also a good demand for boiler plates, while

the foreign demand for heavy plates in general is so great that it cannot be met. Prices are firm at 137.50 to 140 marks. Where higher prices are demanded on hurry orders they are obtained without difficulty. Nevertheless it is mentioned in one report that some selling is going on at less than the convention's official price of 133 marks. This is due to the fact that the convention is now on such an insecure basis that the members do not dare to call a meeting for laying out next year's business lest it result in a breakdown of the organization. The latter was weakened substantially by the withdrawal of three of its most important members (Gutehoffnungshütte, Phönix and Hoesch) some months ago. Busines in thin plates has grown more active. In galvanized sheets a good demand continues. Tin plate mills report a more active trade, with orders in hand running far ahead.

Bids Asked for 700 Locomotives

Rail mills have considerable work in hand for outside markets, and further business is coming in. More home orders have come into sight. There is active work on grooved rails for both home and foreign markets. Locomotive shops were made happy by the announcement yesterday that the railroad authorities of Prussia and Alsace-Lorraine are asking bids for above 700 locomotives, to be delivered by the end of September, 1913. The shops were already satisfied with the volume of their business.

From the hardware trade satisfactory conditions are reported in most branches. Many shops have work running beyond the end of the year. New business, however, is coming in more slowly, especially from the export trade. Makers of axes and hatchets are complaining of American competition and that even the German market begins to show a preference for American goods. Builders' hardware is feeling the effects of the unsatisfactory conditions prevailing in the building trade. The Solingen makers of swords and sabers are working on big foreign orders. Farmers' hardware has had an unusually good season and continues to be bought actively. Screws and rivets are going off rapidly, but buyers of wire nails are holding back business for remoter dates in the hope of better prices. The shipments of rods, however, are running above the allotments of the trade organization. The pure wire mills recently appealed to the latter to reinstate the drawback of 5 marks a ton on exported wire, but it agreed to do this only on orders filled prior to August 15.

The Belgian market has further improved. Several days ago a Brussels dispatch mentioned more active buying and an advance of iron bars for export by 1 shilling and basic bars by 2 shillings per ton. The news from the French trade continues strong and the several selling organizations in pig iron are negotiating for a consolidation.

New Works Construction Stimulated

A number of new building operations are reported from the German iron trade this week. Krupp is building a rod mill of 100,000 tons yearly capacity at the Friedrich-Alfred Hütte in Rheinhausen, and is also planning the erection of a plate mill there. The Rombachor-Hütte will begin next spring two blast furnaces at Maizieres near Metz. The de Wendel firm will build two open-hearth furnaces at Hayange in Lorraine. The Hasper Eisen und Stahlwerk has decided to build an additional rolling mill.

Further excellent company reports have stimulated iron shares on the stock markets. The Hoesch Company of Dortmund announces a dividend of 22 per cent., as against 20 per cent. for last year. The Geisweider Eisenwerke, the most important maker in the Siegerland district, pays 15 per cent. against 11 on the common and 17 against 13 on the preferred shares.

New York

NEW YORK, September 4, 1912.

Pig Iron.—The largest buying by a single interest in the recent movement was a total of nearly 20,000 tons for pump works in Eastern and Central Western territory. Nearly half of this amount was placed with Buffalo furnaces. A small part of the iron is for delivery this year, but for the most part deliveries run to July 1, 1913. Several companies having foundries in other territory, but whose buying is done through New York, are in the market for considerable amounts. In New Jersey one foundry is inquiring for 1800 tons, another for 500 tons and a number of foundries in that district will buy for the first quarter of 1913. In New England the largest pending inquiry is for 5000 tons, of which the greater part is for gray iron work, while about 1000 tons is malleable. Buffalo furnaces are well sold for the remainder of this year, and in a few instances a higher price is asked by furnaces there for delivery this year than for the first quarter of 1913. A number of Buffalo furnaces are quoting $15 to $15.25 for 1913, while as high as $15.50 at furnace has been paid for nearby delivery. Production in the Buffalo district will be increased by changes which are about to be made in the active blast furnace list. Two furnaces will be put in in October. The coke situation is still dominated by the shortage of labor and some Connellsville producers have been pro rating their shipments to blast furnaces, the shortage on some contracts amounting to 20 per cent. Eastern Pennsylvania furnaces are generally asking $15.50 for No. 2 X for delivery this year, but few are willing to deliver any portion of the iron in 1913 except at an advance. One interest has raised its price for No. 2 X for the first quarter of 1913 to $16 at furnace. A break in the Erie Canal will cut down water shipments of pig iron from Buffalo and there is a possibility that it may not be repaired in time to permit of any further canal shipments this season. We quote as follows for Northern iron at tidewater: No. 1 foundry, $16.50 to $16.75. No. 2 X, $16 to $16.50; No. 2 plain, $15.75 to $16. Southern iron is quoted at $16.75 to $17 for No. 1 foundry and $16.25 to $16.75 for No. 2.

Structural Material.—Demand continues to be made up of small lots, which aggregate sufficiently to prevent the mills from making any measurable step toward quicker deliveries and which therefore serve to keep prices very strong. The decided dullness in new building projects of size noticed in the last few weeks is now attributed in part to high rates for money, but, of course, the promise of the local territory in the way of the subway and elevated railroad work has a highly favorable influence on general sentiment. Bids were taken last week for 800 tons additional terminal area work in New York for the New York Central and other new work includes 600 tons for a garage on West Fifty-seventh street for the Mason-Seaman Transportation Company, 100 tons for a bridge for the New Haven at Naugituck and three bridges for the same railroad totaling 300 tons. The general range of the larger structures now being closed is indicated in the recent awards for example to Barber & Ross, Washington, D. C.: Ponce de Leon apartment, Atlanta, Ga., 825 tons; Rueger Hotel, Richmond, Va., 450 tons; Georgetown University Law School, Washington, 160 tons; Sharp Building, Washington, 300 tons; Woodward & Lothrop Store, second addition, Washington, D. C., 700 tons. Plain structural material is quoted at 1.56c., New York, and 2.05c. from store.

Steel Plates.—The local market shows signs that a considerable amount of plates required for building work closed some weeks ago are being bought by the fabricators and it still takes four to six weeks to secure deliveries on universal plates though sheared plates are more easily obtained. Cases are not infrequent of plates being obtained in several days or a week, but a considerable premium has to be paid. No change in the low ebb of car buying has developed, though, of course, such purchases seldom have a direct effect on the New York plate market. Sheared plates are strong at 1.56c., New York, and universal plates at 1.61c.

Iron and Steel Bars.—One of the interesting developments in steel bars is that mills are demanding special compensation for the twisting of the bar. Whereas formerly such material could be bought ready for use at the base price, now an additional charge of $1.50 and upward per ton is made. A lot of 50 tons was recently sold at $28.50 per ton, but this included $2.50 per ton for the twisting. Buyers are pressing for contracts for next year, but mills seem still to be holding off. No let up is noted in demand for iron bars and prices are if anything stronger. The quotations are: Steel bars, 1.46c. to 1.51c., New York, and from store 1.90c.; iron bars, 1.40c. to 1.50c., New York, and from store 1.80c.

Cast-Iron Pipe.—General inquiry is decidedly larger, evidently being stimulated by the advancing prices of pig iron. Important buyers are sounding the pipe manufacturers with regard to prices for delivery next year. No public lettings of any importance are announced for this immediate district. Prices are higher on carload lots of 6 in. Quotations are $23 to $23.50 per net ton, tidewater.

Old Material.—The market is quite strong and the tendency is toward higher prices. At the moment the

large consumers of steel scrap and rolling mill stock are not making offers to dealers as the railroad lists for the month are now out and mill buyers are probably waiting to ascertain the result of their bids. Foundries are still buying sparingly. Dealers' quotations, per gross ton, New York and vicinity, are as follows:

Old girder and T rails for melting	$12.00 to $12.50
Heavy melting steel scrap	12.00 to 12.50
Relaying rails	21.50 to 22.00
Rerolling rails	14.00 to 14.50
Iron car axles	21.00 to 22.00
Old steel car axles	15.50 to 15.75
No. 1 railroad wrought	13.75 to 14.25
Wrought iron track scrap	13.00 to 13.50
No. 1 yard wrought, long	12.50 to 13.00
No. 1 yard wrought, short	11.75 to 12.25
Light iron	5.25 to 5.50
Cast borings	7.50 to 7.75
Wrought turnings	8.75 to 9.00
Wrought pipe	11.50 to 12.00
Old car wheels	13.25 to 13.75
No. 1 heavy cast, broken up	11.50 to 12.00
Stove plate	9.00 to 9.25
Locomotive grate bars	9.00 to 9.25
Malleable cast	10.00 to 10.50

Ferroalloys.—Unimpaired strength continues the feature in the market for 80 per cent. ferromanganese, which is still quoted at $53.50, Baltimore, for delivery next year. Several thousand tons have been sold at that price. Sales of spot ferromanganese, while not numerous, have been made at $56. Inquiries for all positions at present before the trade are estimated to total 2000 tons. Ferrosilicon, 50 per cent., continues firm but quiet at $72.50 for carloads and ranging down to $70 for larger quantities.

Metal Market

NEW YORK, September 4, 1912.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead		Spelter	
Aug.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
29	17.75	17.62½	46.75	4.65	4.55	7.25	7.10
30	17.75	17.62½	47.55	4.85	4.72½	7.25	7.10
31	17.75	17.62½	.....	4.85	4.72½	7.35	7.20
Sept.							
3	17.75	17.62½	47.20	4.85	4.72½	7.35	7.20
4	17.75	17.62½	47.20	4.85	4.72½	7.35	7.20

The copper situation is unchanged, except that buying has subsided. Tin is dull but prices are higher, largely because of the statistical showing. There has been a further advance of $4 per ton in lead. Spelter is higher and firm. Antimony is unchanged.

New York

Copper.—While there was a good business in copper in the latter part of August, there has been very little buying since the last report and it is not expected that there will be any trading of consequence until the statistics of the Copper Producers' Association are issued. The metal is as firm as ever on a basis of 17.75c. and there are no indications of any character of a decline. Exports in August made a good showing, totaling 29,529 tons, and the metal shipped abroad in the first eight months of this year shows an increase of 4977 tons as compared with the same period of last year. The present market is generally without feature. Lake is quoted to-day at 17.75c. and electrolytic at 17.62½c. cash New York. The price quoted in London to-day was £78 18s. 9d. for spot and £79 6s. 3d. for futures.

Copper Averages.—The Waterbury average for the month of August was 17.75c. The average price of Lake copper for August, based on quotations in *The Iron Age*, was 17.72½c., and of electrolytic, 17.62½c.

Pig Tin.—There has been but little activity in the tin market in the past week, although prices have stiffened considerably and statistics are favorable for a continuance of strength. The deliveries into consumption in August amounted to 4300 tons and the total for eight months shows an increase of 3900 tons compared with the same time last year, while the total visible supply on August 31, 1912—11,285 tons—was 5334 tons below that of August 31, 1911. All of the business done in August was at advancing prices. The sharp advance in the price of tin which will be noted on August 30 in the table above is credited to anticipation of statistics which proved to be well founded, together with a report that there had been heavy buying in London by prominent operators. The effect of the advance was to bring out speculative lots of tin, the holders of which sought to realize profits and a still further effect was to bring the market price below the import cost of the metal. To-day the import cost of tin is 47.62½c., against the price of 47.20c. There is, therefore, considerable pressure to sell but little buying, consumers, as heretofore, preferring to take the chance of obtaining lower prices. The cost of tin in London to-day was £216 75s. for spot and £214 10s. for futures. The arrivals of tin this month were 940 tons and there is afloat 2110 tons.

Tin Plates.—The tin plate situation continues strong and the feeling prevails that a general advance is impending. The price of 100-lb. coke plates is unchanged at $3.74, New York.

Lead.—There was a further advance of $4 per ton August 30 in the price of lead which brought the price as fixed by the American Smelting & Refining Company to 4.85c., New York. Most of those interested in the buying and selling of lead assert that they do not know any satisfactory reason for the second advance, the first having been $3 per ton in the early part of last week. It may be that the first advance which raised the price to 4.65c. resulted in such a pressure of business that the second advance came as a natural sequence. So far as the domestic supply is concerned it appears to be fully equal to the demand. The foreign situation in the metal is very strong and prominent English authorities point out that there is a pronounced dearth of lead in England, mainly because of the depletion of stocks at shipping centers and also because of the difficulty in securing shipping facilities. Manufacturers are therefore compelled to pay high prices. The New York Metal Exchange quotes the price of lead to-day in London at £21 5s.

Spelter.—The advancing tendency in spelter continues, and the metal for prompt shipment is quoted to-day at 7.35c., New York, and 7.20c., St. Louis. October and November spelter sold yesterday at 7.17½c., St. Louis. There is considerable buying, and the strength of the situation is indicated by the fact that there is noteworthy trading in future positions. The Waterbury average of prices paid for brass mill spelter in August is 7.34c.

Antimony.—Prices are unchanged in antimony and aside from a very ordinary demand there is nothing to note. Cookson's is quoted at 8.60c., Hallett's at 7.87½c. and Chinese and Hungarian brands at 7.75c.

Old Metals.—The market is strong. Dealers' selling quotations are revised as follows:

	Cents per lb.
Copper, heavy and crucible	16.25 to 16.50
Copper, heavy and wire	16.00 to 16.25
Copper, light and bottoms	14.00 to 14.25
Brass, heavy	10.25 to 10.50
Brass, light	8.25 to 8.50
Heavy machine composition	13.00 to 13.25
Clean brass turnings	9.50 to 9.75
Composition turnings	12.00 to 12.50
Lead, heavy	4.40
Lead, tea	4.15
Zinc, scrap	5.50

Chicago

SEPTEMBER 3.—The general strength of the market for metals is evidenced by higher prices in nearly all directions. The general movement has not been of unusual proportions. For spot shipment, in particular, quotations show higher tendencies. We quote as follows: Casting copper, 17.50c.; Lake, 17.87½c. to 18c., in carloads for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 48c.; small lots, 50c.; lead, desilverized, 4.80c. to 4.85c. for 50-ton lots; corroding, 5.05c. to 5.10c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 7.10c. to 7.20c.; Cookson's antimony, 9c., and other grades, 8.50c. in small lots; sheet zinc is $8.75 f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 14.75c.; copper bottoms, 13c.; copper clips, 14c.; red brass, 12c.; yellow brass, 9.25c.; lead pipe, 4c.; zinc, 5c.; pewter, No. 1, 28.50c.; tinfoil, 33c.; block tin pipe, 40c.

St. Louis

SEPTEMBER 2.—The metal market shows a steadily advancing tendency. In lead there were several small rises until Friday, when there was a sharp advance from 4.57½c. to 4.77½c., at which it is now quoted. Spelter is firm at 7.05c. Lake copper stands at 18.10c. to 18.22½c. Electrolytic is 18c. to 18.12½c. Cookson's antimony is 8.80c. In the Joplin ore market the past week the basis range was from $52 to $56 per ton for 60 per cent. Under this the top grades ran to $59. Calamine was in good demand at $29 to $31 for 40 per cent., with the best lots selling for $36. Lead ore was stronger at $60 to $61 for 80 per cent. On miscellaneous scrap we quote as follows: Light brass, 5.50c.; heavy brass and light copper, 9.50c.; heavy copper and copper wire, 10.50c.; zinc, 3.50c.; lead, 3.50c.; pewter, 21c.; tinfoil, 31c.; tea lead, 3c.

Iron and Industrial Stocks

NEW YORK, September 4, 1912.

The stock market, while dull, has maintained its strength quite well. The market leaders appear to be awaiting political developments, ignoring the very favorable business conditions. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Bald. Loco., com...	58½- 60¾	Pressed Steel, pref..	37⅝- 38
Bald. Loco., pref...	105⅞-106⅜	Railway Spring, com.	37¾- 38⅛
Beth. Steel, com...	39 - 41⅛	Railway Spring, pref.	104¾-105
Beth. Steel, pref...	72¼- 74	Republic, com.....	27⅛- 28⅛
Can, com.....	38¾- 40¾	Republic, pref.....	88½- 91¼
Can, pref.....	117½-119¼	Sloss, com.....	55 - 55½
Car & Fdry., com..	60½- 62	Pipe, com.....	21
Steel Foundries.....	37½- 38	Pipe, pref.....	60 - 60¼
Colorado Fuel.....	32½- 34	U. S. Steel, com....	72 - 75
General Electric....	182⅛-183½	U. S. Steel, pref....	113 -113⅝
Gr. N. Ore Cert....	45½- 47⅛	Westinghouse Elec..	86¾- 88¼
Int. Harv., com....	120 -121¼	Am. Ship, com.....	46 - 49
Int. Pump, com....	26½- 27⅜	Am. Ship, pref.....	101¾-102
Int. Pump, pref.....	80⅛	Chic. Pneu. Tool...	52¾- 53½
Lackawanna Steel...	43⅛- 45	Cambria Steel.....	46 - 48⅜
Locomotive, com....	44 - 46¼	Lake Sup. Corp.....	33 - 34½
Locomotive, pref....	109⅛-109⅝	Pa. Steel, pref.....	99
Nat. En. & St., com.	17 - 17¼	Warwick	10½
Nat. En. & St., pref.	90 - 90¾	Crucible Steel, com.	18 - 18⅜
Pittsburgh St., pref.....	102½	Crucible Steel, pref.	97½- 98
Pressed Steel, com..	38 - 38⅛		

Personal

John I. Souther, superintendent of blast furnaces of the Cambria Steel Company, has resigned and Robert T. Glazier, formerly assistant superintendent and superintendent of the coke plant, has been appointed to succeed him. M. G. Baker has been appointed as assistant manager of sales in charge of shapes and plates, and L. H. Carlisle, formerly a salesman in the New York office, has been transferred to Johnstown. M. G. Moore, formerly superintendent of the mining department, has been appointed mining engineer, and E. J. Dotterer has been appointed an assistant general manager of sales, in charge of merchant steel bars and Gautier steel specialties. J. M. Cooke has been appointed general superintendent of the mining department and R. C. Bateman superintendent of the coke department. A successor to Fred Krebs, who recently resigned as general manager of sales, has not yet been appointed.

N. P. Hyndman, sales agent of the Washington Coal & Coke Company at Pittsburgh, has returned from a pleasure trip to Nova Scotia.

J. Rogers Flannery has been appointed a member of the Pittsburgh Industrial Development Commission. He is actively identified with a number of Pittsburgh manufacturing interests, being president of the Vanadium Metals Company, president of J. Rogers Flannery & Co., president of the Pittsburgh Paper Box Company, and a director in the Flannery Bolt & Nut Company and the Vanadium Company of America. Recently he was elected a director of the First National Bank of Pittsburgh, and is connected with other financial concerns. He is a member of the board of the Pittsburgh Athletic Association.

John Kagarise, now general superintendent of the open hearth steel plants of the Carnegie Steel Company at Sharon and Farrell, will be transferred in a short time to the company's Edgar Thomson plant, and will have charge of the erection of the open hearth furnaces now being built there.

O. Takayama and K. Morimura, Tokio, Japan, secretary and chief engineer respectively of the Nippon Artesian Well Company, called on the Youngstown Sheet & Tube Company, Youngstown, Ohio, last week. The report that they had placed a large order for tubing with the company is officially denied. The visit was simply one of inspection.

At a meeting of stockholders of the Youngstown Sheet & Tube Company held in Youngstown August 29, J. A. Campbell was elected president; H. G. Dalton, of Cleveland, first vice-president; C. S. Robinson, second vice-president; Richard Garlick, treasurer; Geo. E. Day, secretary and general manager of sales, and John Brandt, auditor. Mr. Brandt succeeds W. B. Jones, formerly auditor, but who has been compelled to retire on account of ill health.

Samuel H. Whitaker, who has charge of the Dayton Coal & Iron Company's plant at Dayton, Tenn., and its sales office at Cincinnati, Ohio, has been appointed vice-president of the company, whose headquarters are in Glasgow, Scotland.

J. B. Andrews, of the Andrews Steel Company, Newport, Ky., is enjoying a vacation in Michigan.

John Sargeant, president Domhoff & Joyce Company, pig iron merchant, Cincinnati, has returned from a vacation spent in the East.

T. B. Rogerson, of Glasgow, Scotland, a director of the Dayton Coal & Iron Company, is visiting the company's sales office at Cincinnati and its plant at Dayton, Tenn.

R. H. Rehm, special representative of the Richmond Iron Works, manufacturer of charcoal pig iron, Richmond Furnace, Mass., will sever his connection October 1.

Dr. W. H. Tolman, director American Museum of Safety, New York, returned from Europe August 27, bringing valuable data on naval safety devices.

M. H. Barker, president American Tool & Machine Company, Boston, has returned from a month's stay in Mexico.

Felix Pflaum, for the past six years president of the Central Iron & Coal Company, Lebanon, Pa., has resigned that position and on September 1 connected himself with H. Sofranscy Company, Allentown, Pa., dealer in scrap iron, steel and metals, as secretary and manager.

C. H. Hallgath has resigned as sales manager of the Wheeling Corrugating Company at Chicago, effective September 1. He has been appointed Western sales manager of the Carnahan Tin Plate & Sheet Company, Canton, Ohio, with headquarters at Chicago.

Frank Wright, Chicago, Ill., has been appointed general works manager of the Ohio Steel Foundries Company, Lima, Ohio. He is a brother of Harry Wright, president of the company.

Joseph B. Baker has become associated with Rickard & Sloan, Inc., 20 Vesey street, New York City, doing business in what is called "Productive Publicity." Mr. Baker, who is a graduate of the Massachusetts Institute of Technology, has been for some years engaged in technical and engineering publicity and among other connections has been identified with the General Electric Company Publication Bureau and was technical editor, technological branch, United States Geological Survey.

Tin Plate Price Advances

PITTSBURGH, PA., September 4, 1912.—(*By Telegraph.*)—Effective Tuesday, September 3, the Phillips Sheet & Tin Plate Company, operating 44 hot sheet and tin plate mills, at Clarksburg, Weirton and Steubenville, advanced its price on tin plate 10 cents per box, or from $3.50 to $3.60 per base box of 14 x 20 coke plates. To-day the Jones & Laughlin Steel Company, operating 24 hot tin plate mills, at Aliquippa, made the same advance. Both companies state that the advanced price applies only on deliveries of tin plate for the remainder of this year, and that no contracts will be accepted for next year's delivery until later in the season or until it is known what tin bars and pig tin will cost in the last quarter.

The Phillips Sheet & Tin Plate Company is making some improvements and additions to its Pope works at Steubenville, Ohio, increasing the tin house and building two more tinning pots, making a total of 20; also increasing the boiler capacity and the annealing and cold rolling departments. Since taking hold of this plant early in the year the hot mill output has been very materially increased, making these extensions necessary. The company is spending about $50,000 on this plant.

The Bay City Copper & Brass Mfg. Company, Bay City, Mich., will have its plant in operation in about two months. Its product will be seamless copper and brass tubing from 1¼ in. down. Thomas W. Clements is president and traffic manager; G. S. Oliver, vice-president and general manager; D. I. Lister, secretary; P. J. Flower, treasurer; C. J. Perry, general superintendent; sales agency, 308 Sun Building, Detroit.

The furnace of the Princess Iron Company, Princess, Va., collapsed on the morning of September 1. Particulars regarding the damage are not yet available.

The Congress on Testing Materials

The Early Sessions of the International Meeting in New York—Discussions Promising World-Wide Scientific and Commercial Value

The Sixth International Congress on Testing Materials is now in progress in New York City and at this writing promises to mark a decided advance forward in scientific progress and in the further peaceful adjustment of commercial relations among nations. The meetings are being held in the Engineering Societies Building, 29 West Thirty-ninth street, and the atmosphere is one quite different from that of the usual engineering gathering, owing to the conspicuously large percentage of foreign participants, the different languages audible in close quarters, the profuse decorations of which a large part is made up of the flags of nations and the general feeling which the conditions impart that something important is being considered and must be done. While the net result of the week's meetings—the professional sessions occupying Tuesday to Saturday, inclusive—cannot well be foretold, it is expected that there will be quite a general focussing of endeavor toward erecting specifications in different countries satisfactory to manufacturing, consuming and other interests, these to lead ultimately, particularly if national boundaries cease to be high barriers between groups of peoples, to specifications of universal application. At any rate there are tendencies apparent that the association is expanding beyond the limited field expressed in its name, the International Association for Testing Materials, and further indicated in the congress's consideration of papers covering properties of materials to a degree highly scientific.

There are 30 nations represented in the association and some one individual from nearly every country was present at the opening session on Tuesday morning. Members had been gathering, however, for days and there were meetings of members of the council and committees on Saturday, August 31, and on Monday of this week. The machinery of the congress had been planned in detail and committees waited at the steamship piers on transatlantic travelers to the congress and members on arriving at the headquarters building found the marble reception hall or lobby of the building divided into sections for registration according to one's country, for exchanging coupons for the different local excursions and diversions and for receiving mail and general information. Badges bearing the wearer's registration number were provided and these carried one, two or three different colored ribbons according to whether the possessor could converse in one, two or three of the official tongues of the congress—German, French and English. It is fitting to say here that even by limiting general discussion to these three languages, the necessity in the sessions for interpreters to expound one's remarks in the two other languages proved the desirability of a single universal language to gain expedition and secure the confidence that such a language would instill that all were mutually in thorough understanding of one another.

The preliminary arrangements for the congress and the management of the social and non-scientific features were in the hands of the so-called organizing committee, established by the American Society for Testing Materials. Dr. Henry M. Howe was president of the committee, Robert W. Lesley and Capt. Robert W. Hunt, vice-presidents; Prof. Edgar Marburg, treasurer, and H. F. J. Porter, secretary. For some months the committee has had quarters in the Engineering Societies Building and its activities and the personnel of some of its auxiliary committees have been noted from time to time in these columns.

All day Monday the Engineering Societies Building was a busy place, centering about the registration of the early arrivals. On Monday evening there was a formal reception in the building under the joint auspices of the American Society for Testing Materials, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the American Institute of Mining Engineers.

Opening Session

The opening session of the congress was held on Tuesday morning, following a reception of the official delegates from governments by the president and members of the council of the International Association. The session itself was opened with a few graceful words of welcome by Capt. Hunt, as president of the American Society for Testing Materials, though Dr. Howe occupied the seat of the presiding officer surrounded on the commodious rostrum by some of the members of the council. The object of this departure from usual procedure appeared presently when Capt. Hunt introduced Vice-President Prof. Martens, who, in German, presented a resolution providing that the congress should bestow the presidency of the International Association on Dr. Howe for the remainder of his term. Dr. Howe, it will be recalled, was appointed acting president by the council owing to the death of the elected president, the late Dr. Charles B. Dudley. Dr. Howe briefly acknowledged the tribute and then took charge of the meeting.

A series of addresses of welcome were made. Gen. William H. Bixby, Chief of Engineers, U. S. A., delivered an address in behalf of the President of the United States, expressing the vital interest of the country in the aims and purposes of the congress, as proved by the large percentage of Americans in the International Association—about one-third—and extending a broad invitation to favor the country again and to participate in conventions which will take place in connection with the exposition in celebration of the completion of the Panama Canal. He paused at each step in his address long enough to repeat each section in French.

Governor John A. Dix, on behalf of the State of New York and Controller William A. Prendergast, on behalf of the Mayor of New York City, also welcomed the congress. Governor Dix made a plea for conservation of resources and Mr. Prendergast argued for the inauguration of business principles in government. Mr. Dix referred to the fact that scientific forestry was practiced in Switzerland 400 years before Columbus discovered America, and he spoke not alone for the success of the principles underlying the motives of the International Association but also for the conservation of human energy. Mr. Prendergast wanted it apprehended that he stood for the efficiency movement, which was often unnecessarily confounded by involved explanation. He felt he was decidedly sympathetic with the objects of the association as through his efforts a standard testing laboratory had been established for New York City, with the result, for example, that the city is buying coal on a heat basis. Further, through the absence of business practices, different departments of the city have been buying the same products at widely varying prices. He considered that New York had a right to be interested in an organization having to do with materials of construction, as in the thirteen years since consolidation it had spent for schools and libraries, $110,000,000; for docks, $86,000,000; for streets and roads, $100,000,000; for parks and drives, $33,000,000; for subways, $73,000,000, and for public buildings other than schools and libraries, $66,000,000.

President Howe then delivered his address which was received with close attention and which created a profound impression of prophecy, humanitarianism and individual and collective duty. It is printed elsewhere in this issue.

With announcements by General Secretary Ernst Reitler, Vienna, the session adjourned. The announcements covered appointments of section chairmen and secretaries and resolutions for consideration at the concluding session of the congress on Saturday morning, these relating in part to the individual charge for participation in the congress and the provision for three vice-presidents. The

last comprehends an affirmation of the action of the council in appointing A. Mesnager, Paris, one of the vice-presidents.

Relation Between Hardness and Resistance to Wear

On Tuesday afternoon were held the first of the simultaneous sectional meetings, three in number; namely, metals, cement and stone and miscellaneous materials. At the meeting of the section devoted to metals twelve papers relating principally to hardness and impact testing were on the programme. Several of these were passed without discussion, while on others the discussion was brisk and interesting. The first paper presented was that of E. H. Saniter, entitled: "Hardness Testing and Resistance to Mechanical Wear." The author compared the tests of F. Robin on dry abrasion, the tests of E. Nusbaumer made on the Derihon machine on lubricated wear with tests on dry rolling wear made by himself on a machine of his own design. The tests showed no particular relation between the wear and the Brinell hardness number. The conclusion reached by the author was that hardness tests are unreliable as indicators of wearing properties and direct wear tests must be made.

Discussing the paper, Henry D. Hibbard laid down two general rules connecting ductility with wearing ability, as follows: Of two steels of the same hardness, the tougher will wear the better; of two steels of the same toughness, the harder will wear the better. However, there are so many considerations involved in abrasion, a slight change in any one of which may affect the entire problem, that general rules, he said, can only be applied with extreme caution. Another speaker related some tests made on Australian timbers, which bore out the statement of the author. These timbers were subjected to sand blast to abrade them. No relation could be observed between the abrasion with a given amount of sand blasting and the Brinell hardness number.

Dr. Walter Rosenhain described some alloys of manganese which he had tested for wearing qualities, and he had found that these alloys with a comparatively low Brinell hardness number showed under tests of unlubricated friction a resistance to abrasion almost equal to that of hardened tool steel.

The next paper presented, which, however, was not discussed, was that by Felix Robin, entitled "Wear Tests of Steels." The paper summarizes wearing tests made in 1909 and reported before the Iron and Steel Institute. A paper coated with abrasive powder was used. This wear test has been found useful for rails in certain services, for files, and for crushers, etc. Results of different forms of wear tests do not agree and each kind of wear must be covered by a special test.

Different Tests for Hardness

R. Guillery, Paris, France, next presented a paper on tests for hardness, elastic limit and resilience under impact, in which three novel testing machines were described. (1) A ball hardness machine has the ball carried in the end of a micrometer screw fitted with a friction head, the ball to rest against the upper face of the specimens resting on a stiff-spring platform. The platform is pressed upward by a definite motion of a lever. On returning the lever, the micrometer screw will measure the indentation. (2) An elastic limit machine compresses a truncated-cone specimen, and a special machine takes an autographic record of the ball hardness along the elements of the cone, thereby locating the section at which set begins. (3) An impact testing machine employs a rotary ram, and indicates the consumed energy in terms of velocity loss by a liquid tachometer.

There was no discussion of this paper nor of the one which followed, by C. Grard, on studies of hardness of steels. Hardness tests may be used in place of tension tests by multiplying the hardness number by a constant, or they may serve for tests of homogeneity. Studies of the attainable precision of the Brinell hardness test showed that errors of observation can be reduced to a maximum of five units of hardness number. The steels should generally be hardened and then annealed before applying the Brinell test. The author considers it practicable to specify hardness and impact test requirements in any steel specifications.

Impact tests was the subject of a report of Committee 26, presented by G. Charpy, Montlucon, France, for the committee. Equality of the results of the two sizes of test bar, approved by the Fifth congress, was found not to hold, the smaller bar giving smaller values. It was recommended that the two sizes be retained provisionally and further tests made, possibly to prepare a table of comparison. The various impact test machines should be studied and descriptions and tests reported at the next congress, if possible. To standardize impact testing apparatus, the first requisite is the establishment of methods of calibration and checking. As the relation between impact-test results and service value has not been established, the collection of statistics is recommended. The report of the committee not being quite complete, the discussion was adjourned until later in the congress, to give the committee further opportunity to complete its report.

Impact Tests

Following the committee's report, a paper was presented by Dr. Aug. Gessner, Pilsen, Austria, on "Notched Bar Impact Tests of Tough Steels." This described comparative tests with test pieces of a standard shape but which, on account of the limitations of the author's machine, were only 10 mm. thick. The results were shown to be greatly influenced by the type of rupture, there being differences up to 50 per cent. with the same material. Also, in tough steels the results are considerably influenced by injuries produced by the edge of the hammer used in the standard pendulum tester. In presenting the paper the author stated that he considered a method of testing so full of errors as this is of little practical value, but he thought that these difficulties can be overcome.

Martin Derihon, Liège, Belgium, in a paper on the brittleness test stated that having used the Fremont impact test since 1904 with upward of 12,000 tests per month for all steel bought or treated in his plant, the author now has only 0.3 per cent. rejections. He believes that the impact test is a reliable means of discovering brittleness and is not unduly severe. He prefers a small test piece as better revealing local defects than the large (30 mm.) bar. Also, the large bar is impracticable for many forged products. The velocity of impact and the mass of the anvil should be large.

Discussing the paper, Professor Hinde approved of it cordially and was glad to learn that the impact test was making its way in industrial plants. The author gave the figure of 20 kg.-meters as the limit of the Charpy impact machine. The speaker inquired as to where this figure was obtained, as with a large number of tests made by him on the Charpy machine the figures were much below this one. He thought it quite probable that results obtained with a Fremont machine were used in formulating limits for the Charpy machine. He called attention to the impossibility of comparing tests made on different types of impact machines, as the results were not always obtained in the same numerical quantity.

Another impact machine paper, entitled "Resilience," was presented by the testing laboratory of the Paris, Lyons & Mediterranean Railway. An impact testing machine is described in which the residual energy of fall is measured by the length of trace made on a card, released at the moment of rupture, by a pen which is deflected when a circuit is broken by the ram at a fixed distance below the test piece. Numerous tests with this machine showed: (1) The true resilience (consumed energy per unit of sectional area) is less with a small hight of fall than with a greatly excessive hight of fall. (2) For the same energy of fall a heavy ram gives lower resilience than a light ram. (3) A sharp notch gives lower values than a notch of other form, and the difference is greatest for relatively fragile material. The experiences of this laboratory show that metals are too heterogeneous to permit of specifying or accepting on notched bar impact tests. There was no discussion.

Slag Inclusions

Slag inclusions was the subject of two papers presented respectively by Dr. Walter Rosenhain and Henry D. Hibbard. Dr. Rosenhain stated that much experimental investigation of slag inclusion in steel has been done in recent years. The author points out the work to be done in studying sulphides, especially manganese sulphides, silicates, oxides, etc., before their relation to steel making will be fully known. Practically nothing has been learned as to their solubility, particularly the solubility of iron

oxide, in iron. Their elimination from molten steel yet remains to be studied. Cracks often result from other causes than slag inclusions. Collections of data must be made to show the relative importance of the several causes of failures. Mr. Hibbard in his paper, entitled "The Solid Non-Metallic Impurities in Steel," proposed the term "sonim" to designate what others have variously called entrained slag, entrained silicates, oxidation products, etc.

There was more discussion of these two papers than of any others at the session. Dr. Rosenhain presented enlarged photo-micrographs, showing some remarkable slag inclusions. After these photographs were made, he had ascertained the character of the inclusions, and found the slag to consist principally of manganese sulphide and calcium sulphide, thus proving the solubility of these substances in steel. He objected to the use of the word "sonim" on the grounds that there were already too many words of special meanings in the language. Its use, however, was defended by Mr. Hibbard, who said that it came as an abbreviation for several cumberous phrases in common use in metallurgy. The use of "included slag" did not convey the same meaning as sonim, as the latter did not necessarily mean slag but all non-metallic solid impurities. It differentiated solid impurities from gaseous.

E. H. Saniter spoke of the influence of size of impurity in addition to its composition, saying that the former often had greater effect on the quality of steel than the latter. He presented several analyses from slag inclusions in the center of ingots and found them to consist principally of sulphides and oxides. Professor Heyn raised a question in regard to the method by which the impurities were contained in the steel. The effect of impurities in actual solution in the metal was very different from that of impurities mechanically suspended in it.

Prof. J. W. Richards, Lehigh University, laid stress on the importance of the question raised by Professor Heyn. He agreed with him that as a general rule the finer the inclusions and the more generally they were distributed in the metal, the more deleterious they were. He discussed the problem from the standpoint of the metallurgist and pointed out the methods available for overcoming the difficulties due to impurities. He used as an analogy the mixture of oil and water. They can be kept emulsified while the mixture is in a state of agitation. If the agitation ceases, the emulsion separates into its constituent materials. Similarly with the impurities in steel. Steel in process of manufacture requires a period of rest during which the impurities and the metal will separate. Three methods are possible of doing this. First, it may be allowed to rest for a limited period in the ladle before casting. This method is more or less imperfect, although practiced to some extent. Second, it may be placed in crucibles and given what is known as a dead melt. This method, however, is impracticable for handling large quantities of steel. The third method is to place the steel in an electric furnace where it may be kept at a dead melt, during which the impurities separate. The speaker believed that the time was coming when all high grade steel would be given this dead melt in the electric furnace, and that with improvements in machinery and processes the cost would not be excessive.

In closing the discussion, Capt. R. W. Hunt cited the case of the 5000 tons of steel rails made last year with this dead melt in the electric furnace. Laid side by side with rails made by other processes, they stood the same severe weather and service as the latter rails did last winter, without a single failure being recorded. On the other hand failures of the rails made by the older processes were numbered by hundreds.

Effect of Electrolytes in Etching Specimens

The first subject considered at the meeting of the metals section on Wednesday morning was the action of electrolytes on metals under stress. A paper of this title was presented by Prof. H. Baucke, which stated, in effect, that the theory of E. Cohen, that metals under stress are in a metastable state which may pass into the stable state under the action of an electrolyte, was supported by two new examples in practice: Steel balls may possess internal stress from hardening. In use they may crack, which phenomenon is also produced by action of an electrolyte, the deformation having the character of molecular change adapted to the amorphous state of solids. Cracking of boiler plates must be considered as a symptom of fatigue, the metal trying to recover its character as a crystalline solid. In fatigued plates formation of flaws may also be induced by action of an electrolyte.

In discussing the paper Dr. Rosenhain disagreed with Professor Baucke as to the correctness of the theory. Cracks in polished steel cannot be detected until the steel is etched, as the edges of the cracks are smeared over in the process of polishing, giving the appearance of a solid surface. The etching agent destroys the smeared-over edges of the cracks, which thereupon appear to develop under the action of the electrolyte, although they were present all the time. In like manner, cracks in boiler steel due to cold working may be developed. Such operations as punching, drilling, drifting, bending, etc., may develop local brittleness, giving rise to invisible cracks which later develop and which then may be mistaken for cracks developed by fatigue.

Professor Heyn doubted the correctness of the theory of re-crystallization which has been called upon to explain every form of cracking in metal not otherwise accounted for. He agreed with the previous speaker in his contentions regarding boiler plate, but was inclined to agree with the author on the development of cracks in hardened steel under the action of the etching agent. The steel is under internal stress, and the removal of the outer layer by the acid disturbs these stresses and permits the cracks to form during the rearrangement of the stresses. Paul Kreuzpointer stated that cracks in boiler plate can usually be traced to defects in the working process either in the steel mill or boiler shop, and that proper supervision in manufacture will largely reduce failures due to fatigue.

Corrosion of Pipe

The corrosion of iron and steel pipe was considered in a paper by F. N. Speller, entitled "Comparative Service Obtained with Wrought Iron and Soft Steel Pipes as Water Lines in the United States." A collection of data on life and resistance to corrosion of pipes was presented, including all cases which could be found on record or otherwise came to the author's knowledge. The tendency of the data is to refute the belief that wrought iron pipes are superior to soft steel pipes.

Professor Heyn claimed that the effect of the presence of local impurities in the speed of rusting was greatly exaggerated. He had tested pipe of steel, wrought iron and cast iron, and he found that the corrosion dpeended as much on the conditions surrounding the use of the pipe, as on the material of the pipe. An important factor was the continuity of service. A pipe carrying water intermittently was found to corrode much more rapidly than one in constant service, due to the fact that the air had a greater chance to obtain access to the metal. Likewise the speed of flow of water exerted a considerable influence on the speed of corrosion.

General Bixby related the results of the action of sea water on the wreck of the Maine in Havana harbor. Where the sea water had free access to the metal of the wreck, corrosion and electrolysis had had full sway, and the metal was badly eaten. In some cases it was transferred bodily from one place to another; for instance a watch was found to be electroplated with iron. Where, however, the mud of the harbor, which was a slime of precipitated sewage, of about the consistency of molasses, had settled on the metal, it had perfectly protected the latter. The engines and other machinery which were buried in mud were in perfect order, but when cleaned and washed had rusted rapidly. A donkey pump found on the vessel had been cleaned and then put in service. It ran for several months, pumping out the ship.

Captain Hunt stated that the result of hundreds of tests on the corrosion of pipe made by him had given disappointingly conflicting results, but tended to show that the quality of the metal was the governing factor rather than the kind of metal. Well-made material would resist rust better than poorly made metal, and he drew the conclusion that the engineering office should have greater voice in the purchase of pipe than the purchasing agent. The tendency to buy of the lowest bidder, irrespective of the quality of manufacture, was responsible for many pipe failures.

International Specifications for Iron and Steel

When the report of Committee 1, international specifications for iron and steel, A. V. Rieppel, chairman, was reached, Dr. Moldenke reported that it was desired not to discuss the subject at the session, but instead he read a resolution which it was proposed to offer at the last of the section meetings on Friday when general discussion on the resolution could then be indulged in before carrying the subject before Saturday's general session. A brief status of the activities of the committee is as follows: Studies and efforts since 1897 have resulted in a series of failures to bring about international agreement on any specification for either steel or cast iron. "A meeting of subcommittee 1a, held in London, May 8, 1912, led to resolutions stating that it would be premature to recommend international specifications at the Sixth Congress, and that the committee is unable to make any proposals on the subject. Subcommittee 1b, on cast iron, has also been unable to forward the formulation of international specifications. In the case of both steel and cast iron, specifications are still in process of development, the producers are not sufficiently interested in the question of uniform specifications, and international unification is therefore premature."

The resolution read by Dr. Moldenke was in effect that on account of the present differences over international specifications, the Sixth International Congress recommends to the Council to request Committees 1a and 1b, covering steel and cast iron respectively, to collect and assimilate the modifications of specifications existing in different countries and to report the results from time to time to the Council. In short, the resolution makes the committee not a legislative body but one to collect information.

Pittsburgh and Vicinity Business Notes

W. A. Stone, Uniontown, Pa., has been appointed receiver of the Keystone Tube Works, Inc., Connellsville, Pa., following an equity suit brought against the company by the Citizens Title & Trust Company, Uniontown, Pa. The plant will be continued in operation.

The Pennsylvania Tank Car Company, Sharon, Pa., has increased its indebtedness to $1,000,000 and will make some large additions to its plant. These consist of a forge shop, 50 x 60 ft.; a fabricating shop, 50 x 125 ft., and an addition of 125 ft. to the main building.

The report that the Kelly Axe Mfg. Company, Charleston, W. Va., had bought a controlling interest in the American Axe & Tool Company, Glassport, Pa., is incorrect. About a year ago, W. C. Kelly, of the Kelly Company, bought some stock in the American Company as a personal investment only. The two companies operate as separate and distinct interests.

The Pittsburgh Plate Glass Company, Pittsburgh, recently placed a contract with the Chapman Engineering Company, Mount Vernon, Ohio, for the installation in its works at Tarentum, Pa., of three Chapman rotary gas producers complete with flue connections. It is stated that these producers, mechanically operated throughout, are guaranteed to run continuously for periods of at least two months without even a temporary shut down for flue cleaning. The Chapman producer is said to be successful in solving the problem of furnishing a substitute for natural gas. The Pittsburgh Plate Glass Company's plant at Tarentum has heretofore been fired by natural gas.

The Old Meadow works of the American Sheet & Tin Plate Company at Scottdale, Pa., making black and galvanized sheets, started up September 1. The plant was shut down June 1 for repairs. A new engine has been installed and other improvements have been made.

August shipments from the works of the Westinghouse Machine Company, East Pittsburgh, were the largest in any one month in the history of the company. H. T. Herr, vice-president of the company, says: "The business outlook has never been more promising. The company is now realizing the advantages of the development work which we have been doing in the last few years. In this respect we have kept ahead of the field in manufacturing steam power apparatus. In addition, we are now working on several new things which we expect to be able to place upon the market within a very short time, and which will greatly increase the productive capacity of our works."

On September 1 the Carnegie Steel Company was operating 45 of its 58 blast furnaces. The idle stacks were one Duquesne, two Edgar Thomson, Edith, Isabella No. 2, which blew out August 19; Neville Island, two furnaces at South Sharon, No. 2 having blown out August 31; one Bellaire, Steubenville, one Ohio at Youngstown, Steelton and Zanesville. Owing to the blowing out of Isabella No. 2, the company has been running short of ferromanganese and last week changed Isabella No. 1 from basic iron to ferromanganese.

The next meeting of the Bridge Builders' Society will be held in the Schenley Hotel, Pittsburgh, September 13.

The Cambria Steel Company reports that its output and shipments of all kinds of products in August were the heaviest in any one month in its history, and beat all previous August records by 40 per cent.

The offices of McCance Brothers, Inc., galvanizers of iron and steel products, will be removed September 6 from the McCance Building, Pittsburgh, to the new works at Verona, Pa.

Obituary

DANIEL MCL. SOMERS, Brooklyn, N. Y., died August 28, after a long illness, aged 71 years. He was born in Alexandria, Va., was educated in the South and located in Brooklyn in 1865. He was one of the founders of Somers Bros., who built up a large business as manufacturers of tin boxes for a great variety of purposes, and after the establishment of the tin plate industry in this country, built a tin plate works. The plant was absorbed by the American Tin Plate Company in which Mr. Somers continued as a large stockholder. He was a director of the Brooklyn Public Library, a charter member of the Brooklyn Manufacturers' Association, a director of the Manufacturers' Trust Company, and a director and former president of the Associated Manufacturers' Mutual Fire Insurance Company. He had also served as Park Commissioner of Brooklyn. He leaves a widow and a son.

DAVID M. FORKER, vice-president D. T. Williams Valve Company, Cincinnati, Ohio, died August 29 at his home in that city, after an illness of about six weeks, aged 52 years. Previous to his connection with the company he owned and operated a rolling mill at Birmingham, Ala., that he sold to the Republic Iron & Steel Company. He was born at Sharon, Pa., the son of Joseph Forker, who was a pioneer in the iron and steel industry in the Central West. He leaves a widow, two daughters and one son.

CHARLES FRANKLIN PUTNAM, president Putnam Machine Company, Fitchburg, Mass., manufacturer of machine tools, died August 30, aged 67 years. He was born in Fitchburg, the son of Salmon W. Putnam, and was educated in the public schools and at Groton Academy. As a young man he entered the machine business with his father, upon whose death, when the business was incorporated, he was made president. He had held various offices of trust in his city. He leaves a daughter.

CHARLES HART SPENCER, for many years special agent of the H. C. Frick Coke Company at Pittsburgh, but who for the past few years has been inactive, died at Long Branch, N. J., August 29. He leaves a widow, five daughters and two sons.

The Cameron Engineering Company, Washington, N. J., has appointed the Standardizing Company, 78 Broad street, New York, general agent for the Cameron portable crane in all countries. It has appointed the same company to be Eastern agent in the United States for the Cameron tramways, trolleys and switches. J. Schleuter, president of the Standardizing Company, was connected with the Cameron Engineering Company for a number of years and is thus familiar with its products.

The American Manufacturers' Export Association will hold its third annual meeting at the Hotel Astor, New York City, September 20 and 21. The headquarters of this association are at 200 Fifth avenue, New York City. W. B. Campbell is president and Henry T. Willis secretary.

New Tools and Appliances

This is essentially a news department for which information is invited

Multiple-Spindle Automatic Chucking Machine.—The New Britain Machine Company, New Britain, Conn., has placed on the market a multiple-spindle automatic chucking machine which has four working spindles and a five-section turret chuck. This machine is a modification of a former design and several changes in the construction have been made. Formerly two pulleys were used to transmit the power to the spindles, but this is now done by a single pulley, which is rigidly supported at the end of the head by an overhanging arm. This arm also serves as a tie for bracing the housings against end thrust and is a stiff casting of cored section. For convenience in operating the camshaft by hand during the setting-up process, there is a hand crank and spindle and worm gear located directly underneath the head. The power feed drive, which is located at the rear of the head, is controlled by a vertical handle. The hand and power feed mechanisms are interconnected so that when the handle is thrown to engage the power feed the clutch on the hand movement is disconnected, so that the crank does not revolve, and vice versa. There is an adjustable yoke on the turret barrel, which can be moved and clamped in any position between the barrel bearings, thus enabling the machine to be used for handling different lengths of work, and also avoids changing the feed cam's position and the overhang of the tool. A split sleeve with a flange at one end and a ring nut at the other supports the adjustable yoke, and the sleeve can be clamped in any desired position along the turret barrel. End play between the sleeve and the yoke proper is prevented by adjusting the ring. A chip pan mounted on wheels is included in the equipment of the machine. The maximum stroke of the feed cam is 7 in.

Rolls of Aloxite Cloth.—To eliminate waste of abrasive cloth and the time of the operator, the Carborundum Company, Niagara Falls, N. Y., has placed its Aloxite cloth on the market in a new form. This consists of rolls ranging from ½ to 2½ in. in width and containing 50 yd. The cloth is snugly rolled on a metal spool and when the operator desires a piece all he has to do is to unwind the roll to the length desired and cut off the strip. In this way there is no waste of material and no loss of time, as the cloth when it comes from the roll is cut clean to the exact length and width desired. The rolls are tacked on the sides with glue to prevent them from unwinding or spreading, and the spool is bushed with wood to give it strength.

Coal Mining Machine.—The Hoadley-Knight Coal Mining Company, 165 Broadway, New York, is introducing a system of coal mining by machinery developed by J. H. Hoadley and W. H. Knight after several years of experimenting. This machine has rotary cutters, operated by motor, which cut the coal much as a circular saw cuts wood. The motor, in addition to its forward movement, is given a sideways swinging motion through a limited angle so that the proper width may be cut. The hight of the cut is determined by the diameter of the cutting tools, which are varied for different hights of coal seams. This machine cuts the coal from floor to roof in finely powdered state and pumps it, mixed with the water of the mine, to any distance desired, as for instance to the coal washer or the coal bins adjacent to coke ovens. The mixed coal and water is handled by electrically driven centrifugal pumps with one or more stages, according to the lift required. It is stated that the machine will drive a cutter 200 ft. in one day, with a capacity for cutting of 100 to 250 tons per day. The machine carries its track with it, having shoes that are automatically advanced with its progress. The aim of the inventors has been to reduce the hazards of the industry to a minimum and at the same time increase the economy of mining and handling coal at every point.

Self-Contained Die Stock.—A new type of self-contained guiding die stock, to which the name Little Wonder has been given, is being made by the J. M. Carpenter Tap & Die Company, Pawtucket, R. I. The handles have holes in them which act as guides for the work and also give a large range by setting the handle on the size required. This method of guiding does away with the use of loose collets and gives a comparatively long support for the work, while at the same time it is possible to use twenty-two sizes of dies with the same stock.

Shop Ladder Safety End.—To prevent ladders from slipping on concrete and other floors and thus protect its men from injury the Lucas Machine Tool Company, Cleveland, Ohio, has developed a safety end for shop ladders, and all the ladders of the company are being equipped with this device. This consists of two steel side plates and a roll which is mounted on a square stud having threaded ends. The roll is beveled on the outer edge, has three sharp grooves turned in its circumference and is milled across the face to produce a series of sharp points. The side plates are first drilled and are then cut out with a square broach which is pulled through in two positions so as to make eight square cornered pockets to hold the ends of the square body of the stud in any desired position. In this way the roll can be turned in eight different positions so as to present new and sharp points to floor whenever it is necessary to do so. The rolls are hardened and are said to hold firmly on concrete and all flooring regardless of whether they are soaked with oil or not.

The Round Head Bolt

W. N. Tillinghast, Fayetteville, N. C., who has had over 60 years' experience in handling tools, writes vigorously of the difficulty with which he has often met of loosening a nut on a rusty bolt having a round head. He says:

"Every mechanic, farmer and farm hand in the land has met with the same trouble. Every one of them complains about this most annoying and objectionable style of bolt, yet manufacturers continue to turn out machines and especially farm implements with round-head bolts. Little thought is needed to convince any man that the loss of time from this ill-advised contrivance must amount to a very great deal every year, with possibly the damnation of not a few souls from the loss of temper and religion. When an energetic workman spends many valuable minutes trying to loosen the nut on such a bolt, something has to give if the nut cannot be loosened by ordinary appliances or methods."

The point is well taken. Every builder of any kind of a machine should guard against the use of such bolts unless they have a slotted head for the application of a screwdriver or a square shoulder fitted in a square hole so that the bolt can be held while turning the nut.

The question is frequently asked as to what automobile maker turns out the largest variety of cars. The Kissel Motor Car Company, Hartford, Wis., asserts that it manufactures the most varied line of motor vehicles in America, if not in the world. The KisselKar line consists of both pleasure and commercial cars. In pleasure cars it makes 30, 40, 50 and 60-hp. chassis with touring, coupé and limousine bodies. A 1500-lb. light delivery wagon and trucks of 1, 2, 3, 4 and 5 tons capacity are also built by this company. The Kissel plant is now claimed to be unsurpassed in completeness.

The Kenton Hardware Company, Kenton, Ohio, has purchased from the receivers of the Hardware & Woodenware Mfg. Company the entire assets of the factory heretofore known as the Kenton Hardware Mfg. Company Branch, including all orders, and has assumed all obligations for their fulfilment. The New York sales office formerly conducted by the receivers will be conducted by the Managers Sales Company, 693 Broadway, for the remainder of this year.

The New York Shipbuilding Company, Camden, N. J., launched August 29 the steamship Guilfoil, an oil tank vessel, for the Gulf Refining Company. It is 405 ft. long and 51 ft. beam.

The No. 11 furnace of the Thomas Iron Company, at Hellertown, Pa., was blown in last week. The stack, which has a capacity of about 75 tons a day, is running on basic iron.

The Machinery Markets

Business of recent date and indications for the fall continue most satisfactory to machinery dealers and manufacturers. In New York the trade is interested in large lists of machine tools to be bought by the New York, New Haven & Hartford Railroad and the General Electric Company and many good minor prospects are before the trade. In New England, August showed a substantial increase in activity as compared with the same month a year ago and the fall promises still better business. In Philadelphia a fair amount of business has been done mostly with buyers outside the local territory. Some long pending deals have been closed in Baltimore and trade has been good. In Cleveland the aggregate of sales was greater in August than in July. While foreign orders have declined in Cincinnati, machine tool builders are busy with orders previously booked and the domestic demand is improving. In Detroit September opens with a good movement in machinery and automobile buying is becoming active. Chicago has a large amount of business pending and new factories and additions promise new demand. In St. Louis August was the best month of the year with increasing business anticipated. Louisville experienced a steady demand for mill equipment. Birmingham found noteworthy demand from the coal mines and sawmills. Interurban developments in Texas are making business in that state and trade is helped along also by a reviving demand from Mexico, especially from oil field operations. On the Pacific coast a large list has been issued by the Western Pacific Railroad and the indications are for an active fall. Western Canada is taking considerable machinery from the East and Southeast, while railroad buying continues active in Eastern Canada.

New York

NEW YORK, September 4, 1912.

Machinery houses in New York did an excellent business in August. One representative dealer reports that the month was one of the best active periods in the history of his company, while others who expected that August as a whole would show a falling off in actual business were agreeably disappointed, for the closing days brought enough orders to materially increase the showing. There are a notable number of inquiries before the trade, many of which are sure to be closed early this month, some new lists of importance are out and altogether the outlook is bright. So far this year is considerably ahead of the corresponding period of a year ago. The New York, New Haven & Hartford Railroad in two lists which aggregate about 80 tools and which will cost in the neighborhood of $100,000, made known its requirements for its New Haven shops. Bids in the case of one list were to be submitted by September 3 and with the other by September 6. The lists comprise general railroad shop tools, including a heading and forging machine, armature press, three milling machines, three radial drills, several grinders, two steam hammers, three planers, a number of engine lathes ranging from 16 to 60 in., three boring mills, woodworking machinery, etc. In the last week the New York trade also received two lists from the General Electric Company, Schenectady, N. Y., which total about 80 typical machine shop tools and represent an expenditure of about $50,000. Included in the lists are radial drills, standard vertical drills, sensitive drills, engine lathes, universal turret lathes, hand and automatic screw machines, horizontal and vertical milling machines, planers, shapers, tool grinders, double emery grinders, tapping machines, metal saw table, keyseaters, gas furnace and bushing press. In the last week orders have been placed in New York by the following among others: The General Electric Company, the Wilkes-Barre Automobile Company, the Newport News Drydock & Shipbuilding Company and the Baron de Hirsch Trade School. The trade is still awaiting the list from the Baltimore & Ohio Railroad.

The General Vehicle Company has filed plans for the foundation of a six-story factory 75 x 327 ft. on Starr avenue, Long Island City, which is to cost $50,000. It is estimated by the company that the foundation and six-story superstructure will cost $400,000. It is reported that two six-story wings will be added later, bringing the entire cost of the structure to $600,000. The new factory is to be the main manufacturing plant for the company's output of both gasoline and electric auto trucks.

The Turner Construction Company, 11 Broadway, New York, has been awarded the general contract for the construction of a new factory building for the American Agricultural Chemical Company, to be erected at its Blissville works, Long Island City, N. Y. This building will be of reinforced concrete throughout, 60 x 355 ft., three stories. Work will be undertaken at once.

The Essex Foundry, 340 Hudson street, New York City, is in the market for multiple spindle tapping machines for cast iron fittings. Photographs are desired, with data, regarding productive capacity of machines, their cost, etc.

The Merrick Fireproofing Company, 1 Broadway, New York, has received a general contract for the erection of factory No. 2 for R. U. Delapenha & Co., at Rudeo-Poughkeepsie, N. Y. The building will be 40 x 52 ft., three stories and basement.

The C. G. Thurnau Company, Utica, N. Y., has been incorporated with a capital stock of $25,000 to manufacture metal railings, etc., and will equip a plant for the purpose. C. G. Thurnau and O. H. Williams, New Hartford, N. Y., and Gilbert Lorenz, 335 Mart street, Utica, are the incorporators.

The New Process Rawhide Company, Syracuse, N. Y., J. Measchem, president, has completed plans for a four-story factory addition 60 x 160 ft.

The Brockway Motor Truck Company, Cortland, N. Y., has been incorporated with a capital stock of $100,000 and will engage in the manufacture of motor vehicles, etc. The directors are G. A. Brockway, C. S. Pomeroy and F. R. Thompson, of Homer, N. Y.

The Forbes Dry Plate Company, Rochester, N. Y., has plans in preparation for a factory addition 50 x 100 ft., one story, to be made to its plant.

An engine house addition is being made to the Read & Lovett silk mill on East Fifth street, Elmira, N. Y. Further enlargements to the plant are to be made later.

Wm. A. Rogers, Ltd., Niagara Falls, N. Y., has completed plans for the factory and warehouse 82 x 700 ft., three stories and basement, brick and steel construction, which it will add to its plant at Main street and the forebay of the Hydraulic Power Company.

The Leroy Hydraulic Electric Gas Company, Leroy, N. Y., will increase its power capacity by the installation of a turbine engine, a condenser, water purifying plant and boiler. The Public Service Commission, Second District, has authorized the company to execute a mortgage for $100,000 and a portion of the funds realized will be used for the installations mentioned. Deforest Shippy is chief engineer.

The Leonard Construction Company, Chicago, has been awarded the contract for the additions to be made to the plant of the United States Light & Heating Company, Niagara Falls, 26 x 240 ft. and 20 x 43 ft., to be used as oil, scrap and acid buildings.

The Groton Bridge Company, Groton, N. Y., is low bidder for construction of a steel bridge over the Owasco River at Auburn, N. Y.

Plans are being completed for the rebuilding of the plant of the New York & Ontario Power Company at Waddington, N. Y.

Plans are under consideration of the Village Board of Weedsport, N. Y., for the construction of a municipal electric light plant.

The Battle Island Power Company, Fulton, N. Y., has been incorporated with a capital stock of $12,000 and will construct a power plant. Thomas Hunter, of Fulton, is president.

The Standard Oil Company is erecting a two-story brick addition to its Atlas Works plant at Babcock and Elk streets and the Buffalo Creek Railroad, Buffalo, N. Y.

New England

BOSTON, MASS., September 3, 1912.

A prominent house dealing in machine tools and supplies reports that business shows a marked improvement over the same period of 1911, the increase for July being 15 per cent., with about the same figure for August. In the opinion of this company the ratio of improvement will be much greater in the remainder of the year. Delivery sheets continue to show extended deliveries on various sizes and styles of machines. The demand for milling machines and gear cutters is very great and the same is true of grinding machines and, in fact, of all types where the function is somewhat special as compared with the older standard machinery. No large lists have been received by the dealers, but one of some size is expected from a new Vermont company which will manufacture machinery.

The new building which will be erected by the Connecticut Electric Mfg. Company, Bantam, Conn., at Bridgeport, Conn., will be four stories, with approximately 52,000 sq. ft. of floor space, of brick, slow-burning mill construction. The business will be removed from Bantam on the completion of the building, which is expected to be about December 1. The company manufactures electrical supplies.

J. H. & P. C. Mueller, Rockville, Conn., manufacturers of braided goods and silk goods, will erect a factory 25 x 45 ft., one story. The Rogers Paper Company, South Manchester, Conn., will build an addition 40 x 60 ft., two stories. One of the buildings of the Portland Stoneware Company, Portland, Me., was burned August 27, with a loss of $75,000. The United Lace & Braid Mfg. Company, Coventry, R. I., will erect a mill at Cranston, R. I., to cost $22,000. The Stark Mills, Manchester, N. H., is building a dyehouse and an addition to one of its mills. W. A. & H. M. Curtis, Westminster, Mass., has purchased the plant of the Ashburnham Mfg. Company, Ashburnham, Mass., and will manufacture chairs, making a specialty of porch furniture.

The Whitin Machine Works, Whitinsville, Mass., manufacturer of textile machinery, will erect an addition to its foundry 100 x 500 ft., increasing its floor space 50 per cent. However, this addition is one planned three years ago and the structural material has been on the ground for two years waiting for more convenient conditions in the shop yard. Now it is being erected to preserve the steel, not because it is proposed to occupy the building in the near future. No equipment will be purchased for the present.

Philadelphia

PHILADELPHIA, PA., September 3, 1912.

The volume of business taken during August was smaller than that of July, largely because of vacations having interfered with the closing of many pending negotiations. Machine tool builders, however, have taken a fair amount of new business, largely from other districts, and are steadily increasing plant operations. While local railroad buying in various lines is active that in machine tools continues to drag, although lists of requirements are understood to have been prepared, but not given to the trade. Special equipment continues in more active demand than does that for the usual standard types of machine tools. A very fair demand for boilers is noted, although that for engines has been quiet. In second hand machine tools a fair amount of business is moving. The foundry trade, as heretofore noted, improved steadily during August.

The Pennsylvania Salt Mfg. Company has obtained permits for the construction of a one-story pump house, 22 x 42 ft., to be located at its plant on the Delaware River between Shunk and Porter streets.

Proposals will be received until September 6 by D. H. Hoch, county controller, Berks county, Reading, Pa., for furnishing the installation of a 200-hp. water tube boiler in the Berks county almshouse. Specifications may be obtained on application to the county controller's office.

A. F. Hammond, superintendent of supplies, School District of Philadelphia, Room 392, City Hall, will take bids until September 4 for a quantity of material for use in the West Philadelphia high schools, including among other items a motor generator, apparatus for the physical laboratories, equipment and laboratory supplies for the science department and a 54-in. Revolute blue printing machine. Specifications may be obtained at the office of the superintendent.

The Philadelphia Rapid Transit Company, it is stated, will immediately begin the work of erecting a car barn 377 x 611 ft. on Luzerne street west of Tenth street, which site was acquired several months ago. A sand house and oil storage house, each approximately 30 x 50 ft., are also to be erected.

The Pennsylvania Railroad Company is asking for bids for a proposed cold storage plant and abattoir to be built in West Philadelphia.

Estimates are being taken by Pfeifer & Co. for the erection of a one-story forge shop 26 x 72 ft. at 148 Bread street from plans by Ballinger & Perrot, engineers.

The John B. Stetson Company has begun the erection of an eight-story manufacturing building 88 x 100 ft. at Montgomery avenue and Fourth street on the site acquired some time ago from the Excelsior Stove Works. Further purchases in the vicinity of the John B. Stetson Company's plant are announced, and it is stated that in the near future the company will build a further large addition to the plant.

The Lea Equipment Company has recently secured a number of excellent orders for centrifugal pumps, including a 1500 gal. per minute fire pump for the Brooklyn Eastern District terminal; a 1500 gal. per minute pump for the Aluminum Company of America and a 3000 gal. per minute volute pump for the same company; also several large units for irrigation purposes for the State of Washington. The demand for Lea cold metal saws is steadily improving. Within the last 30 days this concern has shipped 16 of these machines to Europe.

The Royersford Foundry & Machine Company, Royersford, Pa., reports the receipt of more inquiries for punch and shearing machinery than has been the case for a long time. Business in all its various departments has been steadily increasing, and during the past few weeks shows an increase of at least 10 per cent. over the same time last year.

The Earle Gear & Machine Company has enough business on its books to keep it busy for several months ahead. Among orders recently taken was one for the complete machinery equipment for the dredge Huston being constructed for the Standard American Dredging Company. This company is also furnishing the operating mechanism for the Gatun River Bridge over the Panama Canal; the operating mechanism for the Strauss bascule bridge over Neches at Port Arthur, Texas; the operating mechanism for the Stillaquamish Bridge in Indianapolis; the operating mechanism for the Altamaha Bridge for the Atlantic Coast Line Railroad and the operating mechanism for the Baltimore & Ohio Railroad Transfer Bridge for Staten Island. In addition to the above a large number of orders for exceptionally heavy gears for dredge and mine work have been received. The Earle Gear & Machine Company recently added a large number of new tools to its equipment to care for this increased volume of work, and the plant is now operating 24 hours per day.

The Reading Crane & Hoist Company, Reading, Pa., notes an increase in the volume of business during the past few months of about 40 per cent. Consideration is being given some proposed improvements by this company, but nothing definite has been decided upon at this time.

Baltimore

BALTIMORE, MD., September 3, 1912.

Machine tool merchants report comparatively good sales of special equipment for metal and wood working purposes. Considerable business which had been under negotiation for some time was closed, which aided materially in swelling the month's sales. The total for August, however, while fairly good for the season, fell slightly below that of July. The demand for the usual standard types of machine tools has been spasmodic and was principally for the smaller class of equipment, while sales have been largely of a single tool character. Few sales of engines of any size are reported, the demand for both engines and boilers having been quiet; some makers of tanks and boilers report August business as extremely light, although they have been actively engaged on work already on their order books. The second-hand machinery trade is slow. While machine tool builders are somewhat better engaged, considerable room for improvement is reported. The demand from the railroads for shop tools has been comparatively light, although occasional odd sales of single tools are noted. Irregularity is reported in the demand for machine shop supplies. Contractors' equipment has been in very fair demand. Industrial establishments identified with the iron and steel trade have been more fully engaged. Fabricators of structural steel have booked a larger volume of orders, although most contracts have been small. Few large building operations are before the trade in this district, although a more

active demand is noted in the South. Operations in the foundry trade are still below normal capacity, although the demand is better than that of several months ago.

The W. C. Scherer Company, successor to John Scherer & Sons, is to have a four-story factory building 52 x 67 ft. erected at 802 to 812 Raborg street for the manufacture of doors, window sashes, etc. The building is fireproof and will be equipped with a full complement of electrically driven woodworking machinery.

Proposals are being taken for the installation of a power and heating plant for St. Charles College, Catonsville, Md.

John Cowan, Inc., has the contract, it is reported, for the building of the large storage warehouse at Hillen Station for the Western Maryland Railroad. The warehouse will be of brick and will be one of the largest in the city.

The Consumers' Crown & Seal Company, Baltimore, Md., with a capital stock of $500,000, has been incorporated in Delaware.

Henry J. Tinley, architect, has plans prepared for a four-story warehouse to be erected for George J. Huber at 523 Scott street. The building is to be of brick, fireproof throughout and equipped with an electric elevator.

J. Wilson Leakin is having a two-story garage 38 x 100 ft. erected at Cathedral and Preston streets, for which J. J. Moylan has the contract. It is stated that the Goodyear Rubber Tire Company will occupy a portion of the building, the remainder being used for the storage and repair of automobiles.

The Baltimore Tube Company is now fully established in its new plant at Bayard street and the Baltimore & Ohio Railroad. Its new brass shop will be ready for operation in about two weeks, awaiting only the installation of an oil melting furnace, already purchased. Its new tube department is practically ready for operation. A number of machine tools still remain to be purchased for its machine shop department.

Crook, Kries & Co., who have been located at the corner of Park avenue and Saratoga street, have removed their office, wareroom and drawing rooms to more convenient quarters at 218 West Saratoga street, where they occupy a three-story building 20 x 150 ft. This firm has recently taken several important heating and engineering contracts, including one for a large amount of pipe coil work for the Consolidated Cotton Duck Company, Woodberry.

Chicago

CHICAGO, ILL., August 31, 1912.

The improvements now under way at Elkhart, Ind., for the Lake Shore & Michigan Southern Railway are rapidly progressing, and within the past two weeks machinery has been received aggregating in value $250,000. The Elgin, Joliet & Eastern Railway machinery list issued some time ago has not yet been placed and remains a part of a large volume of pending inquiry. The market of the past week was featured by a demand for milling machines resulting in sales in this market of 12 machines, of which five were placed on one order. The Wisconsin Steel Company bought tools for one of its plants and a Michigan manufacturer placed a desirable order, the two purchases totaling about $7,500. The manner in which orders are distributed over the entire territory emphasizes the extent to which new factories and additions are making a market for new equipment.

The Lyon Metallic Mfg. Company, Aurora, Ill., has had plans prepared for a one-story brick and steel factory building to be 100 x 200 ft. and to cost $25,000.

The Whitaker Mfg. Company, Chicago, manufacturer of tool specialties and hardware, has purchased three acres at Clearing, adjoining its present plant site, as a provision for further extensions.

The Chicago Suburban Gas & Electric Company, Chicago, has been organized with a capital of $6,000,000 under a Delaware charter for the purpose of conducting a public utilities service in the vicinity of Chicago, and it will absorb as a nucleus the North Shore Gas Company, the officers of which are Charles T. Boynton, president; A. V. Foster, vice-president, and W. Irving Osborne, secretary and treasurer.

The Laursen Automatic Pump Company, Eau Claire, Wis., which is desirous of locating in a Western city, has been making investigations to that end. Spokane, Wash, is looked upon with favor, although nothing definite has been decided upon.

The Elgin Automatic Sewing Machine Company, now located at Elgin, Ill., is considering the removal of its factory to Rockford, Ill., or Jefferson City, Mo., where better facilities will be available.

Bauer & Black, Chicago, have let the contract for the erection of a boiler house to be built in Armour avenue at a cost of $40,000.

Architects Schnetzky & Son, Milwaukee, Wis., have been awarded the contract for a factory building to be erected by John G. Patterson on Third street and Christine lane. The building will be two stories, 60 x 130 ft., of reinforced concrete.

The Harris Steel & Wire Company, Chicago, has been incorporated with a capital stock of $125,000 by I. S. Blumenthal, Maurice Alschuler and C. C. Brosius.

The Racine Steel Casting Company, Racine, Wis., suffered a loss by fire of about $8,000 on August 24 when its molding shop was practically destroyed. Rebuilding operations will begin at once.

Deere & Co., East Moline, Ill., have let the contract for a new factory to be located on Thirteenth street near the Milwaukee tracks. The plant will include a forge shop 75 x 200 ft.; three-story factory building 80 x 200 ft., and a boiler plant. The expenditure is estimated at $200,000.

The Adjustable Bed Spring Mfg. Company, Fargo, N. D., manufacturer of a patent bed spring, will erect a new factory at Front street and Eleventh avenue.

The Salem Box Company, whose plant at Metropolis, Ill., was recently destroyed by fire, the loss estimated at $30,000, has made arrangements to rebuild.

At Lancaster, Wis., an expenditure of $50,000 is contemplated for the construction of electric railroads. Address the city clerk.

The Chicago, Milwaukee & St. Paul Railroad will make extensive improvements at Sioux City, Iowa. Proposed improvements include a new roundhouse of 40-stall capacity, enlarged car shops and a new passenger station.

The Fidelity Brass Mfg. Company, Chicago, has increased its capital stock from $25,000 to $40,000.

The Hoff Motor Car Company, La Crosse, Wis., with an authorized capital of $500,000, has been organized by Joseph E. and August J. Hoffweber for the purpose of manufacturing motor cars.

The Central Steel & Supply Company, Chicago, has increased its capital stock from $15,000 to $20,000.

The Oxweld Railroad Sales Company, Chicago, has filed notice of a change in its name to Oxweld Railroad Service Company.

The Dandy Ironing Crane Company, Chicago, has been incorporated with a capital stock of $25,000 to deal in machinery. The incorporators are H. J. Credicott, Orley C. Houghten and H. O. Hamilton.

The German American Car Company, Chicago, has increased its capital stock from $500,000 to $700,000.

Architect A. L. Alschuler is preparing plans for the erection of a four-story brick factory at 108-110 North Paulina street for Frank M. Stresenreuter, Chamber of Commerce Building, Chicago. The estimated cost is $60,000.

The Chicago & Northwestern Railroad will build a one-story brick boiler house at 455 North California avenue at a cost of $3800.

The Witherspoon-Engler Company, Chicago, has been awarded the contract for the erection of the new Pennsylvania 36-stall roundhouse at Indianapolis. Work is to commence immediately.

The Wisconsin Press Making Company, Fond du Lac, Wis., is considering the erection of a $100,000 factory at Grantsburg.

The Milwaukee Yacht & Boat Company, Milwaukee, will erect a two-story tile factory at 96 Clinton street.

The Independent Electric Mfg. Company, Milwaukee, will open bids this week for a new one-story factory building 65 x 125 ft.

The La Salle County Fair Association has let the contract for a new machinery hall to be built at Ottawa, Ill. The building will be one story, 50 x 250 ft., and is to cost $6000. The architect is Jason F. Richardson.

The Model Mowing Machine Company, Chicago, incorporated with a capital stock of $250,000, will engage in the manufacture of mowing machines. The incorporators are George A. Graydon, William F. Olson and E. A. Larson.

The Chicago Cycle Car Company, Chicago, has been incorporated with a capital stock of $2500 by Franklin A. Dean, Jr., Harris Carman Lutkin and Dwight P. Green.

The Chicago, Rock Island & Pacific Railroad through A. T. Hawk, architect, 139 West Van Buren street, Chicago, has let the contract for a one-story roundhouse to be built at Manley Junction, Ill. The building is to have 20 stalls.

The Modern Button & Machine Company, Chicago,

has been incorporated with a capital stock of $25,000 by William Friedman, William Ader and C. J. Ader.

The Fort Wayne & Northern Indiana Railroad is planning the erection of a repair shop at Lafayette, Ind.

The George J. Meyer Mfg. Company, Milwaukee, is planning the erection of a two-story boiler shop and foundry 130 x 140 ft., with concrete foundation and walls.

E. S. Rice has let the contract for two factory buildings to be erected at 1954-62 Clybourne avenue, Chicago, at an estimated cost of $30,000. Fritz Foltz, 6 South Dearborn street, is the architect.

The Hill Pump Valve Company, Menasha, Wis., has filed articles of dissolution as a Wisconsin corporation. W. M. Gilbert was president and T. M. Gilbert acted as secretary.

Haug & Son, Great Bend, Kan., have completed plans for the erection of a new machine shop at Manchester, Iowa, for all kinds of auto repair work.

The Harper & McIntire Company, Ottumwa, Iowa, suffered a loss by fire of about $200,000 on August 27, when its four-story factory was totally burned. The company manufactures hardware.

The Monarch Machine Company, incorporated with a capital stock of $45,000, announces the location of a new factory at Boone, Iowa, for the manufacture of its cement tile machines.

The Collis Company, Dubuque, Iowa, manufacturer of wire, hardware and machinery specialties, announces the removal of its factory to Clinton, Iowa. Temporary headquarters will be in the plant of the Fish Brothers Wagon Company.

The Standard Mfg. Company, Cedar Falls, Iowa, advises that its new proposed plant will be approximately 82 x 264 ft., one story, equipped with an overhead track system. The company will manufacture steel gates and similar lines.

The new Minneapolis & St. Louis roundhouse which is being built at Oskaloosa, Iowa, will be constructed entirely of cement and steel and will consist of 15 engine stalls, one to be used as a boiler room and one as a machine shop. The floors will be of concrete and the pits of steel.

Cleveland

CLEVELAND, OHIO, September 3, 1912.

Conditions in the local machine tool market and in the foundry trade continue very satisfactory. A good volume of business was placed during the week in single and small lots of tools. One dealer took an order from an Ohio maker of automobile accessories for six milling machines for November delivery, this being a duplicate of a similar order for earlier shipment placed by the same buyer during the month. August as a whole showed a good volume of business which in the aggregate was larger than that placed in the previous month. While some dealers sold fewer second-hand tools in August than in July, their August sales of new machinery were considerably better than during the preceding month. A good volume of business is in prospect for the present month, although not a great deal of new inquiry came out the past week, the only list of any size being from the Columbus Foundry & Machine Company, as follows:

The Columbus Foundry & Machine Company's List

One 48-in. lathe, 38 in. over rest, 10 ft. between centers, all geared head with quick changed gear and special crank shaft attachments.
One 30-in. swing lathe, 20 in. over rest, 10 ft. between centers, other specifications as above.
One 24-in. x 10-ft. lathe, standard single pulley drive.
Three 20-in. x 8-ft. lathes, single pulley drive.
One 18-in. x 8-ft. lathe, single pulley drive.
One 18-in. x 10-ft. tool room lathe, with taper attachment, draw in collets, etc.
One 24-in. Steinle, Libby or Gisholt turret lathe.
One 2¼-in. Jones & Lamson lathe with equipment for bar stock.
One 2¼-in. Jones & Lamson lathe with equipment for chucking work.
One plain hand screw machine, one-inch capacity, power feed to turret.
One No. 3 plain double back geared milling machine with power feeds.
One No. 3 double back geared universal milling machine.
One drill press with 8 or 10 spindles, capacity for drilling and tapping ¾ inch.
One 72-inch universal radial drill.
One 72-inch semi-universal radial drill.
One plain grinder, 16-in. swing, 72 in. between centers.
One universal cutter and reamer grinder.
One key seater for fly wheels, etc., to cut ⅝ in. keyways, 16 to 18 in. long.
One open side planer, 3 heads, arm 42 in. long, plane 36 in. high.
One 48 in. or 50 in. vertical boring mill with one plain head and one turret head for fly wheel machine.

The Superior Foundry Company, Cleveland, Ohio, has placed contracts for large additions to its plant. The company will erect a new foundry building 90 x 350 ft. which will be equipped with one cupola, blower room, etc. The building will be of brick with a steel superstructure and reinforced tile roofs. It will have 750 ft. of monitor windows and 350 ft. of skylights. The street front will be of shale brick. All skylights, ventilators, gutters, etc., will be of copper. The company will also build a fireproof pattern storage building and machine shop 60 x 131 ft., 3 stories high and as nearly fireproof as possible. It will be of brick and steel construction. Reinforced concrete floors will be used in the pattern storage department and mill floors in the machine shop. Molding machine equipment will be purchased for the foundry. The general contract for the buildings has been let to the Fath Construction Company, Cleveland. The McMyler-Interstate Company, Bedford, Ohio, has a contract for the structural steel work. Plans and specifications for the additions have been prepared by the Forest City Engineering Company, Cleveland.

The Cleveland office of the Niles Tool Works Company has received an order from the American Shipbuilding Company for a 40 ft. boring mill and a 14 x 25 ft. Bement reversing motor-driven planer. These large machines will be installed in the new machine shop that is being erected by the shipbuilding company at Lorain, Ohio.

The Premier Aluminum Foundry Company, Cleveland, Ohio, has been incorporated with a capitalization of $10,000 to manufacture aluminum castings. The company, organized primarily to manufacture parts for the Premier Vacuum Cleaner Company, Cleveland, will also do outside work. R. E. Hyde, secretary of the vacuum cleaner company, will also be secretary of the foundry company.

The Meilink Company, Toledo, Ohio, has just moved into its new plant at Oakwood avenue and the Lake Shore Railroad. The plant gives the company three times its former capacity. The plant includes four buildings, one 100 x 166 ft., one 112 x 50 ft., one 234 x 41 ft., and a shipping department 75 x 50 ft. Considerable new machinery is being installed. The company manufactures office wall safes, security boxes and other prod icts.

The Defiance Tick Mitten Company, Toledo, Ohio, has commenced the erection of a large addition to its plant at Hawley street and Indiana avenue.

The National Sanitary Mfg. Company, Salem, Ohio, has commenced the erection of an addition to its foundry which will practically double the present capacity. The company manufactures porcelain enameled iron sanitary ware.

The Hickerson Mfg. Company, Findlay, Ohio, has been organized and has leased a factory building for the manufacture of furnaces. W. F. Brickman is president; C. H. Worden, vice-president; Charles H. Adams, secretary, and G. G. Banker, treasurer.

The Eller Mfg. Company, Canton, Ohio, maker of sheet metal products, is having plans prepared for the erection of a new plant on a new site. A one story main building will be erected, about 250 x 300 ft. An office building will also be built. The company expects to have its new quarters ready for occupancy next spring.

The Cleveland-Canton Spring Company, Canton, Ohio, will enlarge its plant by the erection of a new brick building, 52 x 252 ft.

The city of Cleveland through W. J. Springborn, director of public service, receives bids to-day for three water tube boilers and mechanical stokers for the Fairmont pumping station.

The City Council of Salem, Ohio, has authorized the director of public service to purchase an air compressor for the waterworks pumping station.

The W. M. Pattison Supply Company, Cleveland, machinery dealer, has purchased the machinery equipment of the Veitch Motor Mfg. Company, Dayton, Ohio. The equipment includes about a dozen machine tools and an assortment of small tools. The Veitch Company recently established a small plant in Dayton with a view of eventually having quite an extensive plant in that city but later it decided to confine its manufacturing work to its eastern plant.

The Perfection Mortise Machine Company, Columbus, Ohio, has been incorporated with a capitalization of $15,000 by S. A. Webb, A. G. Stafford, W. J. Booth, Cyrus Huling and F. C. Huling.

It is reported that extensive additions will be made to the Girard, Ohio, plant of the Standard Oil Cloth Company.

The Guide Motor Lamp Company, East Fourth street, Cleveland, has purchased a site on Madison avenue, near West 114th street, on which it will build a new plant.

The Pittsburgh Foundry & Machine Company has commenced the erection of a new foundry in Salem, Ohio, on the site of its old plant which was burned a few months ago. The foundry will be somewhat larger than the old one.

Detroit

DETROIT, MICH., September 3, 1912.

September is opening with a good volume of business both in metal and wood working tools and the trade is expecting a very satisfactory month. One feature of the market is that the automobile trade is buying again, not in large quantities, but still free enough to make itself felt. Purchases of equipment from the general manufacturing houses are still below normal, but the machine tool trade is a unit in predicting a better trend in this market during the fall. There is a fairly good demand for handling equipment. Boilers and engines are in better demand and a very fair activity in power plant equipment is noted. The second hand machinery trade shows some betterment and good metal working tools of modern type are finding a ready sale. Shop supplies are more active. Makers of sheet metal stampings report a good volume of orders.

One very satisfactory feature of the local industrial situation is that labor, both skilled and unskilled, is plentiful; one large employer states that whereas during the early summer laborers could scarcely be found applicants are now plentiful, and that the same is true of machinists. Carpenters seem to be the only exception, the demand still exceeding the supply.

The Ignition Starter Company, Detroit, manufacturer of the Disco self-starter for automobiles and motor boats, is reorganizing and increasing its capital to $500,000. The plant of the Gray Motor Company has been taken over, giving the company 20,000 sq. ft. additional floor space.

The Timken-Detroit Axle Company, Detroit, has taken out a building permit covering the erection of a three-story brick factory building to cost $100,000 on Clark avenue.

The Sieder Mfg. Company, Detroit, tent manufacturer, has increased its capital stock from $20,000 to $100,000.

The Detroit Steel Cooperage Company has let contracts for a new factory building on Sylvester street and the Michigan Central Railroad.

The Snedicor & Hathaway Company, boot and shoe manufacturer, 81 Woodbridge street, Detroit, suffered a loss by fire of about $50,000.

The Peninsular Engraving Company, Detroit, has taken out a permit for the erection of a two-story reinforced concrete store and factory building 100 x 204 ft. to be located on Woodward avenue, near Erskine street, to cost about $50,000.

The Come-Packt Furniture Company, Ann Arbor, Mich., suffered a loss of about $1,500 by fire caused by a spark from the machinery of a cotton picker.

George B. Phillips, Dowagiac, Mich., has purchased a 60-acre tract of timber in Porter township, Cass County, and will probably erect a mill at Jones, Mich.

The Western Stay Works, Muskegon, Mich., has sold its stamp department to the Muskegon Tool & Stamping Company of that place and will probably go out of business. Negotiations are also on for the sale of its corset stay department.

The Werner & Pfleiderer Company has been organized at Saginaw, Mich., with a capital stock of $75,000 to manufacture bakers' machinery. This is a separate organization from Werner & Pfleiderer which has been operating the plant of that name in Saginaw. Richard Werner is president, Otto Werner vice-president and Emile Staehle secretary, treasurer and general manager.

The Koenitzer Tanning Company, Saginaw, Mich., has increased its capitalization from $200,000 to $325,000. The capacity of the plant will be increased the coming year.

The plant of the defunct Pontiac Bending Company, Pontiac, Mich., has been sold by the receiver to F. L. Lehner, who expects to organize a new company and place the plant in operation at once.

The plant of the Escanaba Mfg. Company, Escanaba, Mich., has been shut down because of a shortage of logs and operations will be suspended for about a month, during which time repairs and alterations will be made.

The Village Council of Iron River, Mich., has again submitted a proposition to bond for $15,000 for waterworks extension.

It is proposed to establish a branch of the Mohawk Overall Company of Detroit at Calumet, Mich.

The Wizard Mfg. Company, St. Joseph, Mich., has been incorporated with a capital stock of $100,000 to manufacture gas engines and attachments.

The three-story 50 x 150 ft. addition to the automobile plant of the Michigan Buggy Company will be ready for the machinery in about 30 days.

Plans and specifications for the new addition to the East Side waterworks, Saginaw, Mich., have been approved and proposals will be received up to September 5.

The Anker-Holth Mfg. Company, Port Huron, Mich., has let the contract for an addition to its plant located at that place.

James Gow has bought out the interest of his partner, John Campbell, in the Gow-Campbell sawmill located at Muskegon, Mich., and is remodeling the mill and putting in additional equipment. He expects to open it up next spring.

The Richardson Silk Company, Belding, Mich., is rebuilding its engine room which caved in as the result of a washout in quicksand underneath the walls. The loss sustained was about $20,000.

Officials of the Grand Trunk Railroad at Port Huron, Mich., deny any knowledge of the possible removal of the Grand Trunk car shops from Port Huron to Battle Creek as has been rumored.

The Muskegon Aluminum Foundry Company, Muskegon, Mich., has been incorporated with a capital stock of $10,000.

Cincinnati

CINCINNATI, OHIO, September 3, 1912.

While new foreign orders are coming in at a slow pace just now, a large number of machine tool builders are rushed in trying to fill those booked some time ago. The domestic trade is improving steadily. While there is now considerable buying by railroads, the automobile manufacturers are not at present placing any large business. Manufacturers of railroad specialties, such as couplers and other car parts, are rushed, and there is also an excellent demand for railroad track material. The improvement with second-hand machinery dealers is slow, but the foundries report a heavier melt than for a long time. Electrical equipment continues in strong demand.

Secretary Dickson, of the local branch of the National Metal Trades Association, has sent out notices of an outing for members to be held at Laughery Island September 14. A number of outside visitors are expected, including several from Chicago, who are especially interested in the machine tool business.

On October 8 a banquet will be served at the Cincinnati Business Men's Club to about 250 merchants from Europe, Asia and South America, who are delegates to the Fifth International Congress of Chambers of Commerce, meeting in Boston in September, afterward visiting several of the chief manufacturing centers of the country.

The Ideal Steel Wheel Company, Cincinnati, is a new company incorporated with $500,000 capital stock, for the purpose of manufacturing a patented automobile wheel. J. B. Fitch, of the Fitch Dust-Down Company, Cincinnati, is president, and E. H. Maffey is secretary and general manager. The company intends to soon purchase a factory building, or have one built and equipped for its purposes.

The Springfield Spring Company, Springfield, Ohio, was recently incorporated with $10,000 capital stock, to manufacture springs and mechanical devices. Ralph H. Thatcher is interested in the new company.

The Wadsworth Watch Case Company, Dayton, Ky., has let contract for a one-story, 28 x 140 ft., brick addition to its plant at Fifth and Clay streets. L. H. Wilson, architect, Cincinnati, drew up the plans.

To manufacture woodworking specialties and bakers' tools, the W. C. Weidling Mfg. Company, Cincinnati, has been incorporated with $10,000 capital stock. The company already has a plant at 1045 Linn street that will be enlarged at an early date.

John Meinhart, 2129 Barnard street, Cincinnati, is in the market for a second-hand 6-hp. gas engine.

The Columbus Buggy Company, Columbus, Ohio, is buying some extra equipment for a branch plant at Fostoria, Ohio.

The Superior Gas Engine Company, Springfield, Ohio, is having its plant remodeled and enlarged.

It is reported that the Big Four Railroad has awarded the contract for some extensive additions to its repair shops at Springfield, Ohio. Lauderbach & Sieverling, Springfield, are the contractors who have the work in charge.

The Central South

LOUISVILLE, KY., September 2, 1912.

August proved to be an exceptionally good midsummer month for most of the machinery manufacturers and dealers in this market. While conditions were not rushing, there was a steady run of trade which aggregated a satisfactory total. Now that the first fall month has arrived, it is generally conceded that business should show marked stimulation. Power equipment, including electrical machinery, continues a leading item, while wood-working machinery is also selling well. There have been more calls for machine tools in the past few weeks than usual and this improvement has been particularly noticeable. Collections are reported to be somewhat slow, but not backward enough to cause serious inconvenience.

The Howard Ship Yards & Dock Company, Jeffersonville, Ind., has purchased a 5-kw. and a 20-kw. generator from the James Clark, Jr., Electric Company, Louisville, for installation in an unusually handsome steamboat being constructed for the St. Louis & Tennessee Packet Company.

The Henry Vogt Machine Company, Louisville, which has been making steady improvement in its machine shop, recently installed a high-speed lathe of the Gisholt Machine Company for use in the manufacture of forged machine fittings.

Wuest Bros. have completed a building 34 x 50 ft. at 934 West Hill street, Louisville, and are now conducting their machine shop there. They have installed a Willey motor for the operation of their tools. The company does general repair work and has also undertaken manufacturing on a small scale, planning the marketing of a patented grinder in the near future.

The Universal Swing Joint Company, recently incorporated in Louisville to take over the plant of the Kentucky Gear & Machine Works, has elected officers as follows: B. J. Jansing, president; John Bridges, vice-president and general manager; Ben L. Bruner, treasurer, and John H. Hile, secretary.

Paul W. Lamson, Louisville, has received a patent on an emery wheel dresser, the rights for the manufacture of which have been assigned to G. W. Osborn, Cleveland, Ohio.

A heating plant to cost $20,000 will be installed in the Tyler Hotel, Louisville. It is also planned to construct a 12-story annex, which will be built of reinforced concrete. N. Bosler is manager of the hotel.

Adam Vogt, Louisville, who is one of the officers of the National Lumber Company, the sawmill of which was recently burned at Winfield, Tenn., with $20,000 loss, has announced that plans are being made for rebuilding at another point in Tennessee.

George Gowdy and Judge J. H. Thurman, Campbellsville, Ky., are organizing a company for the establishment of a waterworks system in that community. R. A. Piatt, Louisville, is consulting engineer.

The Crystal Block Colliers Company, Ashland, Ky., has been organized for the development of 22,000 acres of coal lands near Peach Orchard, Ky. An electrically operated coal plant is to be installed at once. J. W. M. Stewart, Ashland, and Dr. M. G. Watson, Huntington, W. Va., are officers of the company.

The Old Joe Distillery Company, Lawrenceburg, Ky., has been incorporated to operate the Old Joe distillery, which has been purchased from Wiley Searcy. Members of the new concern are W. P. Frazer, N. E. Gee and J. H. Hawkins. Extensive improvements will be made.

Thomas L. Walker, Lexington, Ky., heads a company which is being organized for the purpose of establishing a clay-working plant near Paducah, Ky. The investment will amount to $40,000.

The planing mill of the Lucas Land & Lumber Company, Paducah, Ky., was burned August 28 with a loss of $65,000. The power plant as well as the machine room was destroyed. The company has announced that it will rebuild.

W. H. Burkholder, Campbellsville, Ky., is considering the establishment of a mill for the manufacture of spokes and rims near Pine Knot, Ky.

William Cornelius, Williamsburg, Ky., and Daniel Taylor, Jellico Creek, Tenn., have applied for a franchise to establish an electric light plant at Pine Knot, Ky. The latter is in the newly created county of McCreary.

J. C. Tarvin and J. S. Webster, Middlesboro, Ky., have formed a partnership for the purpose of selling coal mining machinery and equipment.

The Kentucky Portland Cement & Coal Company, Pine Hill, Ky., is progressing in the construction of its plant and is purchasing power equipment, cement crushing machinery, etc. E. M. Newton, Baltimore, Md., is president of the company, and J. W. Dreisbach, Pine Hill, is engineer.

Plans have been completed by Emmett Smith, Chicago, for the establishment of an electric light plant at Hodgenville, Ky. Machinery will be bought in the near future.

A bond issue of $5,000 will be voted on by the city of Horse Cave, Ky., for the purpose of erecting an electric light plant. Address the clerk of the Council.

Clelland Coleman, Harrodsburg, Ky., who recently purchased the flour mill of Tully & Giliam, is planning to increase the capacity of the plant.

W. P. Childress, Pikeville, Ky., will install a sawmill for the development of a tract of hardwood timber recently acquired near that city.

Clarence McAfee, Jellico, Tenn., will establish a steam laundry. The company organized to operate it is capitalized at $10,000 and will buy machinery at once.

The Scenic Sign Company, 319 Third avenue, Nashville, Tenn., will install machinery for the manufacture of metal signs for outdoor use. A. B. Leech is manager.

R. Brinkley Snowden, Memphis, Tenn., has announced that plans for the hotel to be built in that city will be ready for the contractors early in September. The estimated cost of the building is $500,000.

G. M. Shaw, Memphis, Tenn., is architect for the reinforced concrete building to be occupied by the branch of the Ford Motor Company, Detroit, in Memphis. The building will cost $150,000. Machinery for assembling cars will be installed.

The Rockwood Hosiery Mills, Rockwood, Tenn., has announced plans for the erection of an addition to its factory which will cost $40,000. The building is to be started at once and machinery purchases will also be made shortly.

J. E. Saunders, Nashville, Tenn., has purchased 2700 acres of timber land near Ashland City, Tenn., and will install a mill for the manufacture of cross ties and building material.

The Farmers' Phosphate & Fertilizer Company, Nashville, Tenn., which was recently incorporated with $100,000 capital stock, has announced plans for the erection of four plants for grinding phosphate. They will have an aggregate capacity of 600 tons. An engine, elevator, crusher, pulverizer, etc., will be installed in each mill. J. O. Griffith, Box 302, Nashville, is manager of the company.

M. P. Reeve is in the market for power and special machinery to be installed in a flour mill. His plant was recently burned with a loss of $15,000.

The American Zinc Company, which it was recently reported would install a concentrating mill with a capacity of 750 tons at Mascot, Tenn., has let a contract for the erection of the building and will shortly purchase equipment for it.

Greeneville, Ten., which issued $65,000 of bonds recently, is ready to proceed with improvements in its waterworks plant for which they were authorized.

Birmingham

BIRMINGHAM, ALA., September 2, 1912.

August business as a whole has been quite satisfactory. The demand for boilers, pumps and engines is good both from coal mines and sawmills in Alabama and Tennessee. Small goods are going well, and there is a fair amount of repairing. The outlook is better than it has been in a number of years. In several directions a large trade is indicated. The sawmills are especially busy, with all the orders they can take care of, and a trifle more. High prices have been quoted by lumber plants with the idea that they would prove prohibitive, but have resulted in good-sized orders at the prices quoted. Naturally these plants are in the market for machinery to keep them active in order to meet the demand for the output. The coal prospect is also good. All mines will be busy this autumn and new openings are to be made, all of which will require additional machinery.

The Chapman Construction Company, Bradentown, Fla., will install a plant for the manufacture of waterproof concrete brick.

The Parks-Treanary-Houchin Foundry Company, Atlanta, Ga., has been incorporated with $6,000 capital stock by W. Woods White, W. F. Treanary and others.

The Decatur Cornice & Roofing Company, Decatur, Ala., is adding to its foundry department.

The Atlantic Ice & Cold Storage Company, Atlanta, Ga., will build a plant at Elberton, Ga.

W. R. Parsons will establish an ice plant at Manchester, Ga., to be in operation by December.

J. D. Bacon will equip a steam laundry at Ocala, Fla.

S. P. Turnbull, Moultrie, Ga., and others contemplate building a steam laundry.

Conner & Crosby, Foley, Ala., contemplate an addition to their machine plant.

Sumter Cogswell and Dr. R. A. Martin and Eastern capitalists contemplate the development of a large area of coal lands near Pell City, Ala.

The Alabama & New Orleans Navigation Company, it is reported, will expend $100,000 in the vicinity of Tuscaloosa erecting coal bins, etc., intending to operate steel barges between Tuscaloosa and New Orleans via Lake Borgne canal.

The Savannah Electric Company, Savannah, Ga., will remodel and establish sub-stations. The equipment will embrace three generators of 750, 500 and 300 kw. capacity. A larger generator will be added later.

The Great Eastern Lumber Company will build seven miles of railroad in connection with its development of lumber interests near Savannah, Ga. A roundhouse and repair shop will be established.

Tampa, Fla., has voted an issue of $1,700,000 bonds for waterworks, etc.

The Hardwood Mfg. Company, Smyrna, Ga., will establish a sawmill and planing mill at Dublin, Ga.

The City Council of Meigs, Ga., will receive bids until September 17 for pipe, hydrants, tower, tank and other materials and machinery needed in the construction of a municipal water plant.

For the equipment of its new wrought iron shop the Decatur Cornice & Roofing Company, Inc., New Decatur, Ala., will require one combined double-end power punch and shear with a capacity to shear ¾ x 6 in. bars, 4 x 4 angles, and to punch 1-in. hole in 1-in. metal; one combined rod and pipe threading machine, capacity 1½-in. rods and 2½-in. pipe; one drill press, capacity 1½ in.; one bar bending machine, capacity ⅝ x 3 in., and one power hack saw with 24-in. blade. Second-hand machines, if in good condition, may be purchased by the company.

St. Louis

ST. LOUIS, MO., September 2, 1912.

With the close of the month of August dealers in machine tools report the best month of the year, with improving conditions. All anticipate continued and increasing activity, with little or no effect from political discussion. There have been no new, large lists out in this market, but the total of single tool business is running high, the demand coming from all sources. Collections are good. The request for second-hand tools is increasing. Reports of new manufacturing enterprises in the St. Louis trade territory augment the expectations of improving business.

Ferd. C. Schwedtmann of St. Louis has purchased the interest of H. E. Miles in the Racine-Sattley Company, manufacturer of agricultural vehicles and implements, and the two plants of the company will be consolidated at Springfield, Ill., with some readjustment of mechanical equipment.

The Donk Brothers Coal Company, St. Louis, controlling large mining interests in southern Illinois, has bought a site for a new distributing yard in the northern part of St. Louis and will equip it with mechanical equipment for the handling of coal.

The Kingston Investment Company, St. Louis, a subsidiary company of the Holbrook-Blackwelder Real Estate Trust Company, has taken out a permit for a building to be utilized as a power house, etc., for the new 21-story Railway Exchange building. The building with its mechanical equipment will cost $350,000.

The Hydraulic Press Brick Company, St. Louis, has placed an issue of $1,500,000 of bonds which will be used for refunding purposes and for rehabilitating some of the equipment of the company.

The Wabash Railroad receivers are in the market for bids for the construction of the new car shops at Decatur, Ill., to cost about $500,000 equipped.

The Anthony Kessler's Sons Oak Leather Company, St. Louis, has completed plans for the construction of a leach house 86 x 45 ft. Considerable equipment will be bought.

The E. Myers Lye Company, St. Louis, has purchased a site and will erect a six-story manufacturing building at once to increase its facilities. Considerable new equipment will be needed.

The Waterine Company, St. Louis, has been organized with $20,000 capital stock by F. B. Northrop, Harvey Simpson and J. J. Simmons to equip a plant for the manufacture of boiler cleaning compounds.

The Eggeman Shoe Company, Kansas City, Mo., has been incorporated with $16,000 capital stock by David and A. Eggeman and George P. Norton to manufacture special lines of shoes. A plant will be equipped.

The Knapp Automatic Coupler Company, St. Louis, has been organized with $35,000 capital stock by George N. and John R. Knapp and S. F. Crossman, to equip a plant for the manufacture of a patented automatic coupler for cars.

The Ell-Kay Manufacturing Company, Kansas City, Mo., has been incorporated with $60,000 capital stock by John H. Kitchen, J. Heinzman, Edward F. Sears and William H. Cogsmell to equip a plant to manufacture sheet metal goods.

The Helton Oil Company, Perry, Okla., is in the market for well drilling machinery, opening bids therefor September 15.

Drilling machinery, tools, etc., required for developing oil land will be installed on property controlled by the Rock Creek Oil & Gas Company, at Chickasha, Okla.

The Arkansas Cooperage Company, Jennie, Ark., is in the market for machinery for the manufacture of coiled hoops and requires a daily capacity of 50,000 hoops, machinery costing $10,000.

The Netherlands Company, New Orleans, offices in the Maison Blanche Building, has entered the market for dredges, dredge machinery, pumps, engines, etc., required for land reclamation work.

The Atchison, Topeka & Santa Fe Railroad has plans for a roundhouse with considerable mechanical equipment at Marcelline, Mo. Chief Engineer C. F. W. Felt at Topeka, Kan., is in charge.

The New Orleans Terminal Company, New Orleans, President A. D. Lightner in charge, has contracted with W. M. Wren of New Orleans for completion of the Chalmette slips, the construction of a 500,000 bushel elevator, roundhouses, etc., to meet the needs of the Frisco and Southern railroads under contracts.

The city of Eufaula, Okla., has formally voted a bond issue of $40,000 which will be expended for waterworks under the direction of the mayor.

The city of Kirksville, Mo., voted last Friday to issue $85,000 of bonds for the construction of a waterworks plant under the direction of the mayor and municipal assembly.

Texas

AUSTIN, TEXAS, August 31, 1912.

Besides the several new interurban electric railroads that are now under construction in different parts of this State, plans are on foot for a number of other enterprises of this character. Texas is said to be a very inviting field for this class of investment, as is beginning to be recognized by large financial interests. Up to this time most of such construction has been in northern Texas where the population is more dense than in other sections, but interest is being shown in the possibilities of similar projects in other portions. The tool and machinery trade continues good and the situation could hardly be more satisfactory from the standpoint of the manufacturer and dealer. One of the noticeable and encouraging features of the week is the revival of business enterprises in Mexico, particularly in and around Tampico, where many Americans are largely interested in oil development operations.

Dr. F. S. George, of Dayton, Ohio, representing a French syndicate, has finished the preliminary survey for a system of interurban railroad that is to be constructed from Houston to several towns adjacent to the Houston ship channel. It is stated by Dr. George that all financial arrangements for the early construction of the system have been made.

The Commercial Club, of Orange, Texas, is promoting the building of a bridge across the Sabine River at that place. The river is 325 ft. wide at the site of the proposed structure and the main span will be 225 ft. long.

The Simbro Tram Company, Kirbyville, has been organized for the purpose of constructing a logging tram road. The incorporators are R. M. Simmons, E. C. Simmons and Miller Stewart.

The Jewett Gin Company, Jewett, will install a cotton gin. The incorporators are C. G. Mattison, J. M. Pettigrew and R. H. Evans.

The Consolidated Kansas City Smelting & Refining Company, El Paso, is installing a new converter and blowing engine. It will also enlarge its power plant.

The City Commission of Waco has granted the Texas Power & Light Company a franchise for its proposed electric power plant. It is stipulated that the power station shall not cost less than $600,000, but representatives of the company say that its actual cost

will be not less than $800,000. It will be located in East Waco, where a site has been purchased.

An issue of $8,000 of bonds has been voted by the taxpayers of Hamilton for the purpose of extending the local waterworks distributing system.

Charles B. Metcalf will construct a large dam and irrigation system near San Angelo. The dam will be 12 ft. high and 400 ft. long and of concrete construction.

Williams & Anderson are establishing a cotton gin at Grover.

D. D. Dodd will build a cotton gin near Pine Ridge.

The Port Lavaca Industrial Company will install a cotton seed oil mill, a canning factory and a pickling plant at Port Lavaca. It recently acquired the electric lighting plants of the Port Lavaca Light, Ice & Power Company and W. S. Shell & Co. and will merge the two concerns.

The contract for the construction of a municipal sewer system at Cuero, for which $25,461 bonds was recently voted by the taxpayers, will soon be awarded.

At a mass meeting of citizens of Crystal City a committee consisting of Dr. M. L. Williams, J. A. Jennings, O. A. Stubbs, M. L. Harket and John Pegues was appointed to organize companies for the establishment of an ice factory, electric light plant and canning factory.

The San Angelo Water, Light & Power Company, San Angelo, has under consideration the installation of a filtration plant.

The Commissioners' Court of Orange County will formally consider the matter on September 14 of calling an election to vote on the proposition of issuing about $30,000 bonds for the constructing of a drainage system in the Mauriceville district.

It is announced that the Houston Electric Company, which is a subsidiary of Stone & Webster, Boston, Mass., will make improvements to its street railroad system in Houston the present year at a cost of approximately $1,000,000.

The Texas Power & Light Company, Dallas, contemplates constructing an electric street railroad system at Palestine.

The American Rio Grande Land & Irrigation Company is installing a large amount of machinery in its pumping plant near Mercedes.

The Rock Island, Farwell & Gulf Railway, which is being constructed between Farwell and Big Springs, will locate its shops at Big Springs in consideration of a bonus of $75,000 which has been raised by citizens of the town.

The Commercial Club of Bryan is promoting the establishment of a large carriage factory.

A. V. Daniell, of Alpine, is installing a cotton gin at La Pryor.

The City Commission of Austin will open bids for the construction of a municipal sewer system September 24, bonds having been voted by the taxpayers for the proposed improvement. M. C. Wellborn is city engineer.

The Oaks Mining Company, Mogollon, N. M., has under consideration plans for installing an ore milling plant of 1000 tons capacity.

Frank J. Davis will install an ore reduction mill at his mines near Fluorine, N. M.

George H. Utter is arranging to install a concentrating plant at his Cleveland group of mines near Silver City, N. M.

Former Senator W. A. Clark, of Montana, has had plans prepared for a new smelter which he will install at his United Verde mines at Jerome, Ariz., at a cost of $4,000,000.

The Muskogee Water Power Company has awarded the contract to Sam P. Brown, Jr., Chicago, for the construction of a large dam and the installation of a hydroelectric plant of 30,000 hp. capacity on the Grand River near Muskogee, Okla., at a cost of approximately $1,000,000. An auxiliary plant will also be installed by the company on the Illinois River 15 miles from Muskogee.

The Sunset Central Lines announce through their president, Thornwell Fay, of the preparation of plans for the erection of a large boiler shop and power house at Houston, Texas. The power house will be equipped with duplicate electric generators, power cranes, etc.

The Southern Pacific Railway Company is planning the expenditure of $4,000,000 for power and machinery in the equipment of its repair and construction department of railroad shops at Houston, Texas. W. H. Weils, Washington, D. C., is chief engineer.

The Pacific Coast

PORTLAND, ORE., August 27, 1912.

The only machine tool inquiry of special importance on the coast is the large list issued by the Western Pacific Railroad for its Jeffrey car shop near Sacramento, Cal. Single tool orders from Oregon and Washington firms are coming out with more frequency, however, and indications are favorable for a normal movement for this territory during the fall. Aside from the steady demand from the lumber industry, the principal movement of general equipment is for development work.

The steamer Tacoma Maru, leaving Tacoma, Wash., last week, carried a shipment of electrical machinery valued at about $100,000 for Yokohama and Kobe, Japan.

The Franklin Engineering Company, Seattle, Wash., has a contract for the construction of a large match factory at that place.

The Inland Empire Paper Company proposes to increase its factory at Millwood, Wash., at an expenditure of about $500,000.

The United Engineering Works, Oakland, Cal., has taken a contract for new pumping equipment for the municipal waterworks at Central Point, Ore.

The Rogue River Lime Company, operating near Grant's Pass, Ore., is preparing to install a tramway and new kilns at its quarry.

The Toppenish Iron Works, Toppenish, Wash., is planning to erect a new brick building and install a lot of new machinery.

The Lewis & Clark Steel Company, Tacoma, Wash., is said to have in consideration the installation of a rolling mill to operate on old rails, etc.

The Puyallup, Wash., Veneer & Mill Company, whose woodworking plant was burned recently, is preparing to put up a new mill at once.

Contracts have been let for extensive additions to the plant of the Seattle Brewing & Malting Company at Georgetown, Wash.

The Boise Stone Company, recently organized at Boise, Idaho, is preparing to build an electric railroad and develop a large quarry near that city.

The Western Pipe & Steel Company, San Francisco, is installing in its plant at Richmond, Cal., a new riveting machine built on its own patent by the Joshua Hendy Iron Works, and designed to make riveted pipe in 10-ft. lengths.

The Union Iron Works, San Francisco, has placed an order with Louis G. Henes, representing Manning, Maxwell & Moore, for a 168-ft. double cantilever crane.

The California Steel Ceiling Company is the name of a new concern that has recently established a plant at 2421 to 2423 East Eighth street, Los Angeles, Cal., for the manufacture of steel ceilings, irrigation pipe, conductor pipe, eaves troughs and other products. Woods R. Woolwine is president, D. C. Riddle, vice-president; W. D. Woolwine, treasurer, and C. W. Woolwine, secretary and counsel.

Eastern Canada

TORONTO, September 2, 1912.

Orders for railroad equipment continue to be placed and the work of filling them to be rushed. The railroads could take up a very large output, for they have large needs and have plenty of money.

On the subject of rail shortage, J. H. Plummer, president of the Dominion Steel Company, has this to say: "It may be that we have suddenly reached a point where the requirements for railroads exceed the capacity of the rail mills. If so, this is the first year of which it can be said. It is not so very long since the Sydney mill had to take export orders to avoid shutting down. To-day these mills are turning out rails at the rate of over 400,000 tons a year. In addition a new rail mill is being installed at the Sault, and at Sydney increased steel to operate the rail mill more fully will soon be available. If then the increased demand has come to stay, the mills are well on the way to take care of it."

The Hamilton Gas Light Company, Hamilton, Ont., is adding to its plant.

The Visor Knitting Company, Niagara Falls, N. Y., will put machinery in the old drill shed at Niagara Falls, Ont., and carry on manufacturing operations there.

The McAuliffe Davis Lumber Company, Ottawa, Ont., will erect a large factory on an 80-acre site it has purchased on Russell road near that city.

The Sherbrooke Knitting Works Company, Sherbrooke, Que., will shortly equip a new factory there.

Hutchings Company, St. John, N. B., has remodeled and enlarged its plant for the manufacture of bed springs.

The Canada Furniture Company, Walkerton, Ont., will build a large addition to its plant and install additional machinery.

The Canada Paint Company, factory and warehouse at Walkerton, Ont., will be enlarged.

The Canadian Sardine Company, Chamock, N. B., will build a factory and 50 concrete houses for workmen.

Construction has been begun of the Otis-Fensom Elevator Company's plant at Hamilton, Ont.

Parsons & Parsons, Hamilton, Ont., are erecting a factory to cost $20,000.

William Presnail, Hamilton, Ont., is putting up a factory to cost $25,000.

La Société Française de Specialties Alimentaires, Montreal, is erecting a factory to cost $19,500.

The Alexander Syndicate, Montreal, is erecting a warehouse and office building to cost $1,000,000.

George McLaurin, Ottawa, Ont., will erect shops to cost $6,000.

The Dorchester Electric Company, Quebec, Que., will erect a power house to cost $35,000.

The contract has been given for the construction of the electric power house for the Canadian Ingersoll-Rand Company, Sherbrooke, Que.

The Brunswick-Balke-Collender Company, Toronto, will put up an engine house.

Rotary pumps are being made for the Nova Scotia Steel & Coal Company, New Glasgow, N. S., by the Smart Turner Machine Company, Hamilton, Ont.

All the steel reinforcing bars for many of the largest buildings in the country, including such structures as the Grand Trunk elevator at Fort William, the Canadian Pacific elevator at Port McNicholl and the Harbor Commissioners' elevator at Montreal, have been furnished by the Canada Steel Company, Hamilton, Ont. There has been a marked increase in the market demand for the Canada Steel Company's other products, such as steel angles and bars.

Marsh & Hentharn, manufacturers of hoisting machinery, Belleville, Ont., are increasing their manufacturing capacity 100 per cent.

The Hare Engineering Company will manufacture power equipment and pulp machinery in the works it is to establish in Galt, Ont., at a cost estimated at $150,000.

W. P. McNeil & Co., New Glasgow, N. S., have secured the contract to supply the 3000 tons of structural steel for the main car shop of the Eastern Car Company, which is to be erected there. The building is to be 1100 ft. long and 360 ft. wide. Work will be commenced on the building October 15 and it is expected to be finished by the spring of 1913.

At a meeting of the Cabinet at Ottawa the contract for the second section of the Hudson Bay Railway was awarded to J. D. McArthur, of Winnipeg. For the 68 miles between Thicket Portage and Split Lake the cost is $1,825,000.

C. H. Cahan, Montreal, president of the Western Canada Power Company, announces the sale of 40,000 hp. to interests associated with the British Columbia Electric Company.

The Dominion Cabinet has decided to purchase five large and powerful engines for the Intercolonial, to cost $110,000. Fourteen were ordered a few days ago, bringing the additions of the last few days up to 19.

The by-law to grant a loan to the Imperial Rubber Company to assist in establishing a factory to manufacture rubberized cloth was carried by the rate payers of Tilbury, Ont.

The ratepayers of Owen Sound, Ont., will vote on a by-law a fortnight hence to grant a municipal loan of $60,000 to a malleable iron company, promoted and to be conducted by Hugo A. Gretenkunst, of Milwaukee.

The Beauharnois Electric Company, Montreal, has been incorporated. It proposes to establish a large power producing and transmission system. Its first generating station is expected to be at Beauharnois.

The Grand Trunk Railway has secured a large tract of land at Prescott, Canada, on which it will erect a $150,000 round house, machine and repair shop. Address Chief Engineer H. R. Safford, Montreal.

Work has been commenced by the John Deere Company on the extensive enlargement of the farm implement plant of the Dain Company, at Humberstone, Ont., on the Welland Canal and the Grand Trunk Railroad midway between Welland and Port Colborne. This plant has been taken over by the Deere Company as its Canadian branch.

Western Canada

WINNIPEG, MAN., August 29, 1912.

The industrial situation is pretty much the same as described in the last review; the local houses report a steady demand for machinery and machinery parts. Considerable shipments are coming into western Canada from the Eastern and Southern factories and all the home plants are still busy. The outlook continues very encouraging for a good fall trade.

A. C. Von Hagen, of the United Flour Mills, Ltd., Minneapolis, is still negotiating with the council of Moose Jaw, Sask., for a site and other concessions for the erection of a 2000-barrel flour mill there.

Although the citizens of Regina, Sask., a few weeks ago defeated the by-law to grant concessions to the Ontario & Manitoba Flour Mills, Ltd., Ottawa, the latter has not yet given up hopes of reaching a satisfactory agreement to erect a large flour mill there.

The Sunset Mfg. Company, D. Michael, manager, has been organized to establish a jute and cotton bag factory in Winnipeg, and the ground is already broken for the building that will house the plant.

The International Milling Company, Ltd., of which F. A. Bean, New Prague, Minn., is the president, is enlarging its mill at Calgary, Alberta, and will build an oatmeal mill next year.

A. Sellick, Selkirk, Manitoba, has secured the contract for a large fish hatchery being established there by the Canadian government.

The Canadian Mfg. Company, G. Brown, manager, is negotiating with the town of Selkirk, Manitoba, to establish a factory there for making metallic grain bins, which are said to have sold extensively in the United States in the last few years.

The Vancouver Clay Products Company, Ltd., has arranged with the council of MacLeod, Alberta, to begin operations on a manufacturing plant there within 60 days.

The grain elevator of C. L. Gordon, Shoal Lake, Manitoba, will be enlarged to a capacity of 50,000 bushels.

J. A. McBride, Weyburn, Sask., will build two additional grain elevators at Ogema, Sask.

The Canadian Department of Public Works, Ottawa, announces that the approval of the scheme of the city of Prince Albert, Sask., for power development at La Colle Rapids is being withheld pending the issuance of the necessary permit by the Department of the Interior. This, it is said, is only a formality that will shortly be attended to.

Massey & Co., Chicago, manufacturers of railroad supplies, have completed arrangements to open a factory in Winnipeg. Building operations are now under way under the direction of C. F. Massey, one of the firm.

City Engineer Mason, of Prince Rupert, B. C., has plans prepared for a sewer system in that place.

The town of Yorkton, Sask., will install a motor fire fighting apparatus and a new electric oil engine. T. F. Atcheson is the clerk of the town.

The Union Supply Company, Rosthern, Sask., is building a flour mill of 150 barrels capacity per day to replace the mill of the company that burned last year.

The Canada Cement Company, Ltd., Montreal, has announced that it will add extensively to the capacity of its plants at Winnipeg and Calgary. It is said that the improvements to the different plants of the company in western Canada will involve an expenditure of about $4,000,000.

Government Purchases

WASHINGTON, D. C., August 29, 1912.

The Bureau of Supplies and Accounts, Navy Department, Washington, will open bids September 24 under schedule 4800 for miscellaneous electrical equipment, under schedule 4801 for steel-plate convertible fans, under schedule 4803 for one resaw band machine and one counter-sinking and drilling machine, the last two for delivery to Norfolk, Va., and under schedule 4802 for one surface sanding machine for delivery to Boston, Mass.

The Bureau of Yards and Docks, Navy Department, Washington, will open bids September 21 for one 15-ton manually operated single trolley traveling crane, 48-ft. 11½-in. span, for the central power plant, United States Naval Torpedo Station, Newport, R. I.

The supervising architect of the Treasury Department, Washington, on September 10 will open bids for supplying steel furniture for the United States Post Office and Court House at Philadelphia.